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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Sixteen-inch Pipe-cutting and Threading Machine.

We give on this page an illustration of a pipe-cutting and threading machine intended for the largest and heaviest work in that line. The hole through the spindle is 18 inches diameter, admitting 16 inch pipe with couplings on it to be easily passed through to the dies.

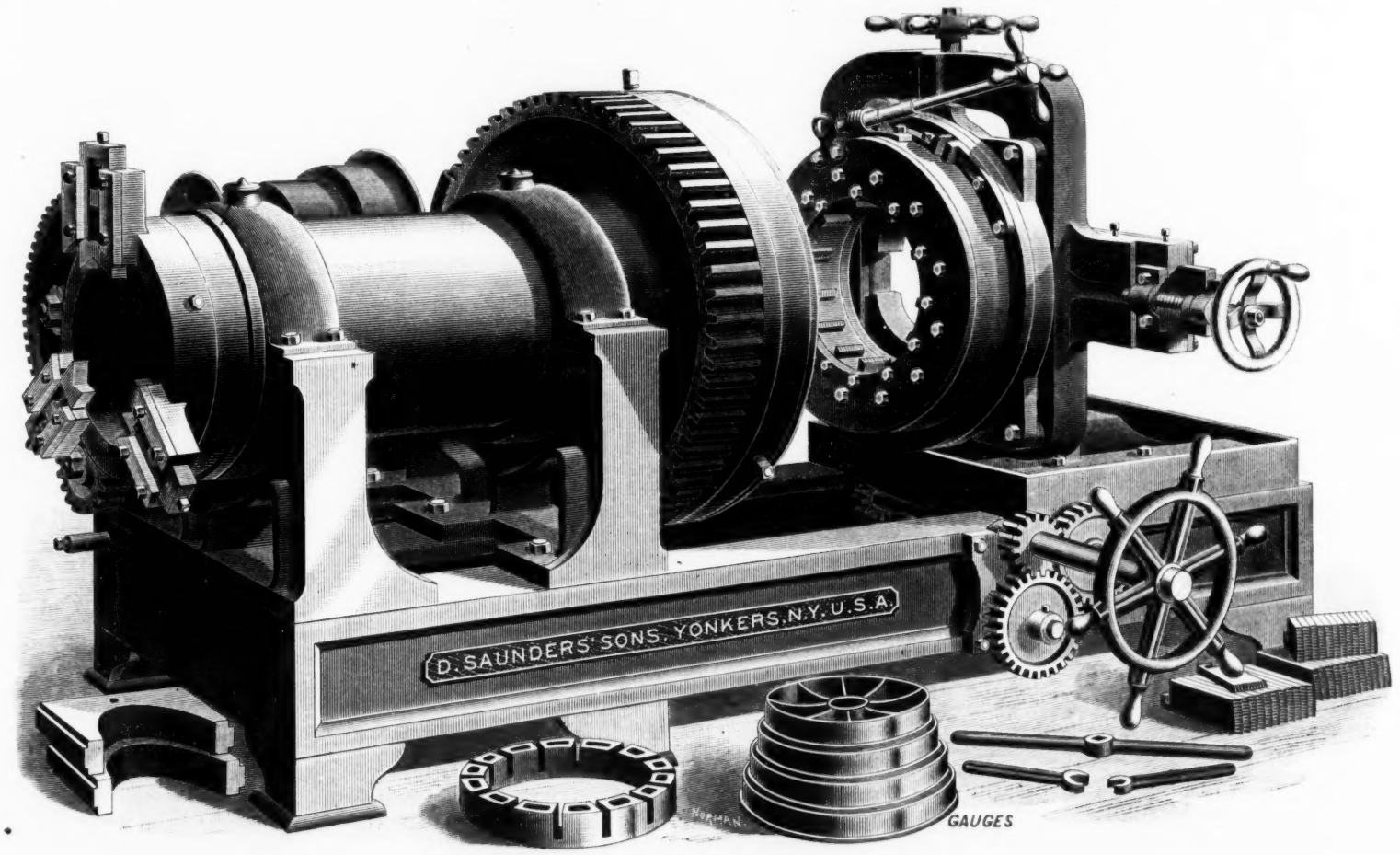
The spindle is driven by triple gears, the main driving-wheel being placed as close to the chuck as possible, and practically equal to it in diameter. The chuck is of the standard three-jawed type, and there are jaws at the rear end of the spindle to steady the pipe.

The die shown in place in the machine is adjustable by the movement of a ring in which there are cam slots that operate to open and close the chasers. The ring in this case is turned by a worm, and there is a stop which can be set, so that the chasers are readily set to size after having been opened to remove a pipe. There is also a stop which limits the opening of the die, and this stop is so arranged that it can readily be removed, allowing the die to be opened further, sufficiently to allow the chasers to be removed without taking off the front plate of the die holder. The chasers are set to size by means of the ring gauges, shown on the floor in front of the machine, and when cutting the smaller size of the two for which any given set of chasers is adapted, the supporting ring seen at the left of the gauges is put into the die holder, and the chasers passing through the slots in this ring are thus supported near the cut.

Just back of the die is the rest in which the pipe is supported while being cut to length. This rest is essentially a square frame, made to receive two jaws, which are square outside, and which, when together, form a circular opening the size of the pipe, there being a set of jaws for each size, so arranged as to be very readily inserted. The frame which holds them is made sufficiently strong, so that a pipe which is not round may be put through the supporting jaws, and while the machine revolves it, the upper jaw is forced down until the pipe is made round by the pressure upon it. Back of these jaws is the cut-off slide which is operated by the hand-wheel and screw shown.

The diameters of the cone pulley steps are 18, 21 and 24 inches for a 6-inch belt, and the ratio of cone pulley speed to that of spindle is 88 to 1.

The range of capacity of the machine is from 9 to 16-inch pipe. It weighs about seven tons, and occupies a floor space 10x5 feet. It is built by D. Saunders' Sons, Yonkers, N. Y.



SIXTEEN-INCH PIPE-CUTTING AND THREADING MACHINE.

Conveniences in the Machine Shop.

BY A MECHANIC.

I believe that every well-regulated machine shop should have a cutting-off machine and centering device of some kind. The old-fashioned plan of having the blacksmith hack off the stock with a cold chisel should be among the things of the past.

Centering being such a common job, a good machine or device for the purpose is a great convenience There is one rig for this purpose that I wish to speak of particularly. It is the little Slate sensitive drill press with centering attachment, and for the center drill, the combination center drill and reamer, that is, the drill formed on the point of the reamer. The work being held in a vertical position allows the oil a good chance to get at the point of drill. No matter how heavy the piece is, it balances on the lower center or cup, and so has no tendency to cramp the drill. The drill being very short and stiff is more likely to start centrally than where the common drill is used, and as long as there is sufficient length of drill on the reamer we are sure that every center drilled is deep enough. The machine being sensitive there is less liability of breaking drills than where the common hand lathe is used. When there is no centering to be done this little drill press is just as good for plenty of other work. For centering long work, I believe there could be a hole in the floor, and a clamping device arranged to hold the work around the body, allowing the end to extend below the floor, provided there is nothing below to interfere.

I will now go back to the tool-room or its equivalent. I said before that the man at the window is the part that I would not have. We don't all think alike, though. But in whatever else we disagree, we need about the same plan for keeping tools, that is, have a home for everything. We need the check system, or its equivalent, whether we have the man at the window or not. The purpose of the check is to know who has got a tool, when in use, so that, if any one else wanted the same tool they might know where to find it. In the absence of a regular check, a piece of paper with a man's name or number written upon it should answer the same purpose. I would be ashamed to admit that I employed men who I expected would steal tools, and carry them out of the shop. There are many men who treat all they have business with as rogues. This may be good policy, but I don't think so. I believe there are many men who, if they find they are continually treated as rogues, will come to the conclusion that they might as well be such.

Making a proper arrangement for keeping tools in order requires special thought to adapt things to fit the shop. There is one suggestion I wish to offer about a cabinet for keeping such standard tools as arbors, taps, reamers, parallels, chuck drills, rose bits, and such tools that do not get shorter by wear. We usually see such tools kept in racks, so that each whole tool can be plainly seen. I think this is not necessary. It seems to me that a cabinet arranged like the letter boxes in a post-office, that is, deep pigeon-holes, the depth to correspond with the length of tools, so that the end of each shall extend enough to be got hold of, would be better. If we have four one-inch arbors we should have the pigeon-holes for inch arbors large enough to hold all of that size, and so for all. We do not need to have all these tools plainly in sight, for they are standard tools, and we know what they are, but for special tools the racks are more suitable. Each pigeon-hole in our cabinet should be plainly marked to indicate what tools and sizes are kept there. A neat arrangement for this is a polished brass strip screwed on, with the names and sizes stamped on it with large figures and letters, which letters should be blacked so as to be easily seen.

I think standard sizes should be adopted, not that better work will be done, but for con-

venience. The work can be done cheaper. If we jig work as much as is practicable, we will find lots of places where it is desirable to keep sizes about the same, so while we make gauges for use in maintaining this same size, there is wisdom in making it a standard size. The Richards system, made by the Betts Machine Company, is as good as anything I know of for standard measurement. This consists of a set of 57 snap gauges with plug of same size on each, running by $\frac{1}{16}$ from $\frac{1}{4}$ inch to $2\frac{1}{2}$, and by $\frac{1}{8}$ to 4 inches, and by $\frac{1}{4}$ to 6 inches; also a micrometer (or measuring machine) with a number of end measures for setting so as to measure by thousandths from 0 to 26 inches. Besides this there is a cone composed of reference disks for use in refitting the snap gauges when they become worn or broken. For a large shop this complete rig is of value. For the general work the tool maker can make gauges from these, and then when every machinist has a good extension micrometer caliper (besides a small one) the shop will be pretty well equipped for measurements. Adjustable reamers are a necessity in maintaining standard sizes.

Many machinists get a wrong impression when they hear talk about measurements in thousandths of an inch. They seem to think that this is great fineness. Now, it is not. I thought so before I commenced to use the micrometer caliper, but I found that with my old-fashioned inside and outside calipers, I could always, in making a fit, get it, the first time trying, considerably inside a limit of .001 inch. It takes practice to do this, but there are plenty of machinists who can do it. In working to standard sizes, good judgment is needed, just the same as by the old plan. It should be borne in mind that it is a scheme for convenience.

If we turn a size so that we have to push the gauge over it, it is not the size of the gauge, but may be much larger. When using spring calipers, we have to feel very sensitively, and although it does not require so much skill to use the rigid gauge, it takes some. Standard rings are of use, for the snap gauge or any caliper that measures across only two high points does not always show the size of a shaft, because there is very little cylindrical work done that is absolutely round. We cannot always find two of the highest points that will come opposite each other.

I have said before that I thought it was possible to make all parts of a machine to the drawing, and have them go together without fitting, but that I did not believe that this plan was practicable when carried out to the letter; it should be left to the judgment of the good mechanics to decide. I wish to say this again. Some people bite very sharp at the interchangeable plan, for they think it is new. I want to say that there is nothing so very new about it. King Solomon built a temple on the interchangeable plan, years before the war.

In the last few years I have heard something like this: The machinists' limit, .001 inch; the blacksmiths' limit, $\frac{1}{8}$ inch; the stone masons' and rough work contractors' limit, $1\frac{1}{2}$ inch, and so on. This is all new to me. I saw in the AMERICAN MACHINIST some time ago the assertion that "none of the better class of machinists are satisfied to do any kind of work with a possible error of more than .001 inch." This is news to me. I did not know this before, although I have been acquainted with many men who I supposed were good machinists; in fact I pretend to be one myself. I feel pretty well satisfied sometimes, if I get some work within $1\frac{1}{2}$ inch. My father taught me a very important lesson while I was working with him in his blacksmith shop. He said, "When you get your job done, stop hammering." This lesson was not complete then; it took quite a number of years to perfect it. I had to find out at what point I should consider it done. Finally I settled this question to my satisfaction. I had to learn some of the theory of the business, some of the "whys and wherefores," so as to be able to judge what would be required of the completed work, then I established my standard: *Make it as good as will be appreciated.* This is my standard, and all the standard I want. It is a very flexible standard, for it ranges all the way from .0001 inch to $1\frac{1}{2}$ inch or more. This standard, to be of value, requires judgment, and no mechanic or machinist is complete without such judgment and such a standard.

It is a common belief that a machinist is a kind of human machine to chip, file, scrape, turn and plane or mill metals to some size set for it, and to that size within a certain limit, depending upon the quality of the machine, or the fineness of the man. There are many of these human machines, and their number is growing greater. They are not machinists or mechanics, they only think they are. I have often read about the drawing-room containing all the brains of the place, but I have never seen it. I do not say that the drawing-room does not require plenty of brains, for I know it does, but we need just as good in the machine shop.

A few years ago I read in an English mechanical paper an article about "How to run a machine shop." The writer dwelt for considerable time upon the requirements of the superintendent. He should be perfect. He would have a mechanical engineer as good as can be found. He would have draftsmen with 20 pounds of clear brain each. He would have one machine shop foreman, whose ability is way out of sight, but for the rest, "anybody to sling to the work." I thought at the time that the writer was not well acquainted with his subject, and I have not changed my mind yet. If I had the capital to start a good machine shop, and wanted to hire a good manager, I would like to know such men, for the same reason that a mariner wants to know where all the dangerous obstructions are, so that he may steer clear of them.

There never was a very good chance in the machine shop for the "lunkhead," and there is less to-day. We need plenty of brain, and we do well when we do not confine all the brain to one man, or two men. We would be lucky if the whole crew was loaded with it. Brain is not cheap stuff, and there is no danger of getting too much of it.

Knock-off Motions for Steam Engines.

BY W. H. BOOTH.

Annexed (Fig. 1) is a sketch which I made of a simple knock-off gear, which I found attached to an engine. I do not think the engine could have been a large one, as the whole of the work of release has to be performed by the governor, but my note-book contains no mention of dimensions. The rod

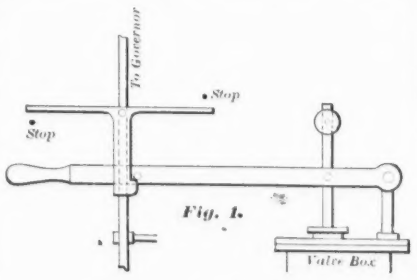


Fig. 1.

from the governor simply carries a detent hook, which is released when contact is made with either of the stop pins.

The release of the detent lets down the throttle hand-lever and closes the valve, which may be the same valve as regulates the engine, if of a simple throttle governing type.

In English locomotives it is customary to carry the valve spindles backward to what is termed the motion plate—a stiff vertical plate, extending between the frame plate, between the cylinders and the driving axle. This motion plate carries two bored sockets, in which work the enlarged ends of the valve spindles, which have thus a very steady bearing.

This arrangement, however, with the reversing link slung from the weight bar shaft by swinging links, causes the link to work slightly up and down, and so produces slight slip of the block.

In American practice this block slip is eliminated by swinging the block on a link of the same radius as the suspension bar carrying the link.

The other day, traveling to York, I saw a device on an engine of the L. & Y. Co., at Wakefield, which was new to me, and seemed well devised to get rid of block slip. It is shown in Fig. 2.

The valve spindle was knuckle jointed at *c* to a rod *d*, which carried the link block at *e*, but was continued to *f*, where it was hung to a suspender *b* of a length equal to the link suspender *a*. The suspender *b* was pivoted upon the weight bar shaft as shown, and the point *e* is thus made to rise and fall very nearly an equal amount with the link, reducing slip to a minimum.

At York were some of the compounds of the N. E. Ry.; they seemed easily handled, and got away freely. Returning to London, through Manchester, I got amongst half a dozen drivers and firemen of the L.

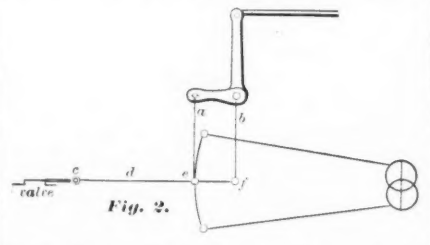


Fig. 2.

N. W. line. We had on a three-cylinder compound and an ordinary and were a heavy train. These men confirmed the general opinion that the compounds could get away with anything, and beat any other engine up to a certain speed, beyond which they did not seem able to add further speed. One can understand such heavy engines with their equivalent of two $21\frac{1}{2}$-inch cylinders, and no coupling rods, being very powerful tractively, but the curious limitation of speed seems to point to the insufficiency of the exhaust passages of the large cylinder. Opinions were divided as to coal consumption, one man expressing himself to the effect that, seeing how much large fuel passes out at the funnel, there could not well be much economy. The manner in which this company runs so many trains with two engines, one of which is often equal to an ordinary with $21\frac{1}{2}$-inch cylinders, and both of which are practically coupled engines, does not appear to point out either the advantages of compounding or of coupling on this side the water.

With sand blown under the driving treads at low speeds and an adhesion in excess of cylinder power at high speeds, why load up an engine with coupling rods as though it were a slow freight engine?

Class *K*, of the P. R. R., always looked like an engine which would give a good account of itself, if uncoupled.

The trouble nowadays about technical education does not seem to be understood.

Years back in this country in the early days of the steam engine, the engineers of the time—men like Rennie and Fairbairn—were known as millwrights. They not only could work with their hands, but also with their heads; they thought out and actually worked to a conclusion their own ideas, but they did not stick to the working part when able to get others to do so for them. These old millwrights were all-round men, and to one of them—Fairbairn—is due the change in all manner of gearing which practically has continued to the present day.

Long after this period, too, when a man served his apprenticeship to a mechanical engineer, he would be properly bound and taught his trade in a proper manner, being very likely put through both pattern and fitting shop, and sent to work out, erecting machinery and repairing. In this way his opportunities of seeing outside work, observing machinery in motion, and gathering general knowledge of allied processes, were often very great.

Apprentices of the present day miss much of this; they are put to bolt screwing, and making stock articles, and never get out of the one corner of the big shop, in which stands the machine they attend. Such a chance is not one to commend itself to a youth of intelligence. Thousands of intelligent boys do go through such a course, and perhaps remain for years simple machine minders. They can scarcely claim to be called machinists, as we like to understand the term. If they have brains, and lack opportunity or strength of character to free themselves from their position, it is likely they will be found engaged in other pursuits during their leisure hours—pursuits, which, like photography or geology, afford them the brain exercise they need, and the interest in life which they cannot obtain from their means of livelihood.

It is one of the grand results of the modern system of manufacture, so much extolled by those who reap the chief profits, that a man works from year end to year end on one machine, and on that one machine performs one operation only. Take the watch industry, for example, which is so closely divided into details. A man spends years in turning up spring cases or stamping out wheels, or drilling holes in a slip of brass or steel. He does the operation allotted him on a machine set to a gauge by a foreman, and his sole duties consist in turning a pair of handles to and fro. It is probable he is as dexterous at the end of a month of this work, as at the end of a year. Now, an old-time watch maker, who did piece by piece every bit of work in a watch, and finally set it going, was a king compared with the thirty or forty men who divide the work between them. The new style produces the better watch, but not the better men. Now, an industrial college cannot surely be of much service to the bulk of modern detail producers, nor will the modern system of construction and workshop practice produce much, in the shape of machinists, as compared with the older method of apprentice ship.

The bigger and better the shop, too, the worse will be its production in the line of handicraftsmen. Regarded purely from the standpoint of getting a living, it is as likely that the man who has been taught to do one thing, and can do no other, will oftener secure work than the better informed and more intelligent all-round man, who, however, may some day get a superior position, which the pure mechanic could not hope to fill. It seems to me that modern systems of manufacture are quite incompatible with the technical college. I do not see how one can be made to foster a special ability for the other, unless amongst those whose opportunities take them more or less out of the narrow rut of life, for which the modern system of interchangeability is really responsible. I would not be understood to be decrying the modern system, which has come to stay, for it seems to be the means whereby the very slavery to one idea which it has created will be finally abolished by the shortening of the hours of work, and the setting free of more time for pursuits more congenial and intellectual. Men in positions calling for intellect are all right already—they scarcely require more leisure for any pursuit calling for thought or study, but the purely machine attendants, who now spend all their life to get a living, will some day secure this in a short period of dull toil, and be free for a reasonable time for the pursuit of pleasure, and it is very certain that the hobbies of this class will not consist of anything resembling their work.

As compared with this class, however, and still differing from the class of directors or designers, there will always be an intermediate class of mechanics whose duties are more broad—such men as are now sent out to erect machinery and put it in working order. This is a class which seems to be most undermanned, and yet its members have undoubtedly better times than the majority of the community. The machinists, too, in shops of general engineering and repair, must always, as machinists, be superior to the modern system men, and a good school of handicraft might be of use in preparing men for these duties; but for the vast majority, whose natural abilities are unequal to higher positions than to work on a single detail, the technical school is of little value for the purpose Prof. Sweet intends it should be. It will perhaps help men who have ability to get out of the groove, and those who

have not ability will neglect it. As a training school for boys alone it would be useless. Prof. Sweet refers to hundreds of English boys whose parents pay large sums to have them taught a trade. I do not believe a single shilling is thus expended with any idea that the boy shall finally turn up as anything less than chief engineer or mechanical adviser to the Pasha of Turkey or equally exalted personage. The very term of premium apprentice is fast becoming a term of reproach, and nowadays one hears ex-premium apprentices who will do their level best to hide the fact or speak of the premium as nominal.

Take other instances. The late Sir Joseph Whitworth endowed several mechanical scholarships specially for the purpose of assisting young men to a thorough engineering education. Actual skill as a handicraftsman was one portion of the examination. Hardly any of the Whitworth scholars have turned out practical men. The best of them have at most become professors of engineering, which they teach before they have acquired any really sound practical experience. Others of them have gone into the patent office, and it is confessed that the scheme has proved a failure, so far as the ideas and intentions of the founder are to be accepted, and even further than this. Now, if Prof. Sweet's ideal college were to be established to teach very little beyond handicraft it might be patronized by those who, having money to spare, would make use of the college as a means of shirking a practical shop drilling; but the ultimate object of such users would certainly not be a life of handicraft. If the college taught a little more than pure and simple handicraft it would be availed of by those already proficient in handicraft, with the idea of acquiring such further knowledge as a means towards getting something supposed to be better. It is unfortunate, but to be feared true, that handicrafts are becoming despised, and in this utilitarian age it is certain that less is thought of the skilled worker than was once the case. In past ages there was perhaps not much iron working practiced, but what there was was good. Building, and all its accompaniments, was infinitely superior to that of the present day. Nothing, for example, built now can compare with such buildings as the cathedrals of York, Gloucester, Lincoln or Ely, many hundred years of age, and yet unmistakably the work of architects and masons to whom those now living are not fit to hold a candle. The reason is largely to be found in the obliteration of the individual which has taken the sentiment out of handicraft.

The question of money also largely affects the question, and there be few men willing to earn a dollar as skilled workers, when a dollar twenty-five is to be had as something else.

For the bulk of workers their day's work is a toil, not a pleasure. It may be faithfully performed, but of very necessity it has little or nothing of interest in it. In some work there is a real interest, as for example in rigging up temporary contrivances to do some special work, in changing the valve gear of an engine with a view to fuel economy, and perhaps more than anything else in a nice repair job away in the country, with few tools, and a providential old scrap heap. Then a man has a chance of using his head and hands, and some knowledge acquired at a technical college might come in useful; but, as I said above, it is the few men who get such work to do as this, and I notice they always take good care to grumble at their hardships. This, of course, is done out of pure kindness to others who might be disposed to seek such work themselves, if not charitably warned off by present sufferers. Have been there myself, and would be the last to deny the charm of handicraft. Will not some of the readers of the AMERICAN MACHINIST who attend machines in a modern works give their opinions of the value of the technical college, *i. e.*, will it serve its supposed end of raising a class of skilled and contented handicraftsmen. Prof. Sweet writes under the bias of his position as a director of handicraftsmen. He naturally wants skilled workers to carry out his plans, content to do so in a perfect manner, without hope of ultimate improvement.

This is asking much more than is asked by the most advanced socialists, for they do but ask that every man should work sufficiently to provide for life and insurance; and after work, refreshment; they would utilize to the utmost every economic means as a means to reduce labor to a minimum all round, and make matters bearable for those to whom were allotted the uninviting tasks. Given the possibility of this ideal, and the revival of handicraft would follow, but it would be dissociated from the idea of living by means of it, just as now so many really skilled workers are the amateurs who work without any reward other than the pure satisfaction of doing something and producing something, even if it does not go beyond engine-turned box lids.

Uncle Ben's Letters.

No. 1.

My Dear Tom:

So you have been chosen superintendent of the Eagle Iron Works. I hardly know whether to congratulate or to pity you. You are quick and bright; I believe you are a good boy, and I know you are a good mechanic. I won't say, like many of your friends, "I know you will succeed," for I don't know it. To say so would be a lie, might make you vain, and throw you off your guard. Whether, with your skill, you succeed or not, depends largely on how much plain common sense you have. But I will congratulate you on one thing—you have a chance of success, and are going into a good school; I have seen many men fail to pass in that school—some of them splendid fellows—and I am going to show you some of the snags that wrecked them.

First, then, Tom, don't be self-conceited; this is one of the commonest diseases of young foremen. At first, no doubt, you will be modest and careful enough, but after one month has rolled by, and you find the shop is not a total wreck under your management, modesty will very likely give way to a self-satisfaction that will make you ridiculous if you don't check it. Don't ever let in the idea that you have done better than others could do, and don't imagine that the shop couldn't run without you. There are lots of sensible men in every shop, who size the boss up very correctly. They will know just what your caliber is, and you can't fool them. Therefore don't try. Don't ever pretend to know it all. If your men are convinced that you are fairly well informed they will respect you. But they will instantly detect and despise any false pretenses in this line. Moreover, when you really do know a thing, show it by your actions rather than by words.

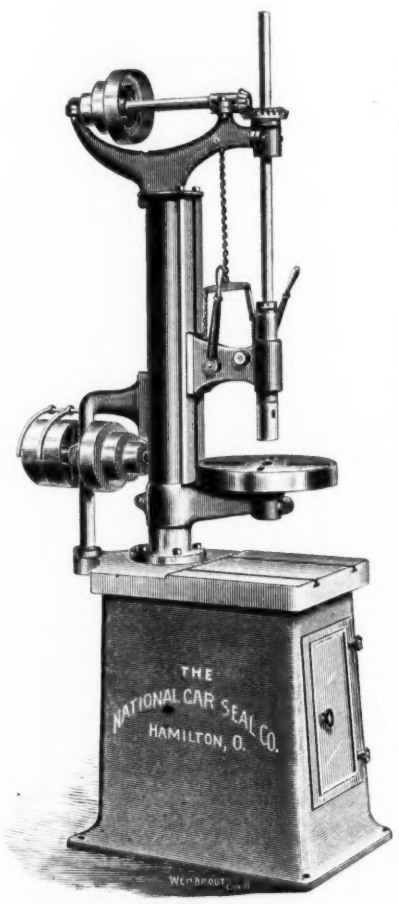
Don't be afraid to ask advice, when necessary. There are men in that shop, I'll be bound, from whom you can learn a big lot. Therefore, when you are "stuck" on some problem that would puzzle anybody, don't be ashamed to seek counsel of some level-headed man in the shop. He can probably help you; and, if the problem is a hopeless one, you at least have the comfort of good company in your perplexity. But don't ask advice habitually or needlessly; and, if possible, counsel in each case with the man who is to do the work in question. Don't go over his head to some one else; it hurts his feelings, and don't work well. When, for instance, a difficult pattern is to be made, full of novel and peculiar features, consult the head molder as well as the pattern maker. Above all things, don't fall into the habit of always leaning on the same man, or the same two or three men for advice; it will ruin you all.

Be calm and deliberate. No matter what emergencies arise, don't act, or give orders, or talk at all without giving yourself time to think. I have often had a perplexing job come into the shop, or a bad break occur, late in the afternoon, that paralyzed me. In such a case I always looked it over coolly and deliberately, and gave no sign of what I thought of it, or what I intended to do. In fact, I didn't know; but, ten chances to one, an hour's study after supper, when I had time to think, would clear away the difficulty, and in the morning I would go at the job so easily that they all thought I intended from the start to do it just that way.

In such cases it generally pays pretty well to note carefully and silently any suggestions that may be dropped by any of the men; I have learned a lot in this way.

Keep your temper; don't ever speak roughly to your men; no treatment can be too good for a good American machinist. If a man is not good enough to be well treated, you don't want him. And don't ever get angry at a hard job, or a poor tool, or an accident—it makes the men laugh at you.

UNCLE BEN.



A New Light Drill Press.

We illustrate herewith a drill press which is especially intended for light work up to ⅝" diameter. As will be seen, the machine rests on a cabinet base, which serves as a convenient place to keep fixtures, besides providing a firm support to the top of which work can be fastened or fixtures attached if desired, the table swinging around out of the way as usual with larger machines. The sliding head and spindle are both balanced by a weight which is suspended in the column and attached to both in the manner shown, so that the head may be adjusted conveniently with one hand. It is secured to the column by the simple movement of a lever, which works an eccentric attached to a T-headed bolt. The spindle is worked by a small lever with rack and pinion, and the pinion shaft has its bearings in eccentric bushings which can be turned, and thus the wear and lost motion between the teeth of the pinion and rack taken up. The spindle is $1\frac{1}{16}$" diameter, and is bored to fit the No. 2 Morse taper. The tight and loose pulleys are 7" diameter by 2¾" face; cone pulleys are for 1½" belt.

The table is 13" diameter, and its greatest distance from the end of the spindle is 14". Greatest distance from end of spindle to base of machine, 24". The machine is made also without the base, to set on the bench, and in either style, is especially intended for doing good work of the lighter class, rapidly and with the minimum loss from breakage of drills.

The makers are the National Car Seal Co., Hamilton, Ohio.

The Engineers Club of Philadelphia has voted unanimously to apply for articles of incorporation.

Launch of the Steel Ferryboat "Bremen."

A new steel ferryboat, built for the Hoboken Land and Improvement Co., was successfully launched at the shipyard of T. S. Marvel & Co., Newburgh, N. Y. The length of boat over all is 220 feet; breadth, 40 feet, and depth, 17 feet. The boat was named "Bremen." It is the second screw ferryboat built for the Hoboken Land and Improvement Co.; the first boat of the same type is the "Bergen," which was launched on October 25, 1888. The performance of this boat has met the expectations of her designers, and encouraged not only this company, but also the Pennsylvania R. R. and Erie R. R. in building other boats of the same type.

The engines for the "Bremen" are in the course of construction in the shops of W. & A. Fletcher Company, at Hoboken, N. J. This boat, as well as the third boat of the same type, to be named the "Hamburg," now in course of construction at Marvel's shipyard, will be fitted out with Blake pumps, including the combined air and circulating pumps with compound steam cylinders.

An Automatic Candlestick.

The well-known mechanical engineer, Mr. Frank Jenkins, of 88 Liberty street, this city, has found time, amid the distractions of other business, to invent a patent candlestick which is both handsome in its appearance and automatic in its operation, and possesses, among other merits, those of being durable and comparatively inexpensive.

The candle being held in a spring frame, is caused to burn entirely down without readjusting the holder, and without any waste or fouling. When the candle is burned, the remaining piece of wick and the few remaining drops of the candle fall automatically into the removable bowl from which all may be easily emptied, and the candlestick is then clean and ready for another candle. As in ordinary candlesticks, the fag end of the candle usually melts into waste, the relative economy of the improved candlestick is not less apparent than its convenience, in admitting of the use of shorter candles when desired. As the candle for some years past has been steadily regaining its old place in public favor, and Mr. Jenkins' candlestick admits of also being made in ornamental forms, in addition to the smoothly polished brass, copper and nickel-plated styles designed for general use, there is likely to be a large demand for it. It is being manufactured by J. H. Bunnell & Co., 76 Cortlandt street, New York.

Those champions of American labor who imported into Pennsylvania the Huns and Poles to work their mines are now experiencing some of the inevitable consequences of their duplicity. Some years ago we visited one of these mining districts, and meeting there a Norwegian with whom we could manage to converse in his own tongue, we learned a good deal of the methods for supplying and governing labor in the coal mines. Later on we managed to secure a copy of the report of the Congressional Committee, who in 1886 investigated the labor difficulties in the anthracite regions of Pennsylvania. From these things has been built up an opinion that if the "Huns" could get at the right men, some of their killing might fairly be excused.—*Industry.*

The Mason Regulator Co., of Boston, have acquired the exclusive right to manufacture and sell the piston throw indicator for air brakes, patented by Mr. Frank Robinson, of Bangor. Mr. Robinson is the master mechanic of the Maine Central R. R., and this device was invented by him to supply a long-felt want upon railroad cars. It is perfectly simple, and indicates at any time to a car inspector the condition of the piston of the air-brakes. The Mason Co. will soon have description and catalogues ready for distribution.

The St. Louis Meeting of the American Boiler Manufacturers Association.

On the sixteenth of April, 1889—scarcely more than two years ago—a few boiler manufacturers met at Pittsburgh, Pa., pursuant to a call from some daring spirits, and resolved themselves into an association, taking as a name the American Boiler Manufacturers Association. A constitution was adopted, and other business transacted; business essential to a fair start as one amongst the rather unlimited number of associations, societies, or whatever name they may be known by, that find opportunities for good work. In fact, at that, the first meeting, an unprejudiced observer would be constrained to admit that the boiler manufacturers of this country were, in the ability to organize, second to no other distinctive element of the country. For while only two days were given to work and sight-seeing (and Pittsburgh had many things to show), when the time for adjournment came the new organization stood upon pretty solid ground, so far as new organizations go; it was in very good condition for operations, offensive and defensive.

These men—these boiler manufacturers—came together imbued with the belief, and there were and are a good many that shared this belief with them, that as boiler makers had never made any special efforts to take care of themselves, as a whole, they were rather left behind in the race that was being made in other manufacturing interests through organized effort; through an understanding of the principle that so largely predominates in co-ordinate matters in manufacturing, as in other things, viz., that within certain pretty wide limits what is for the advantage of one is for the advantage of all.

About six months later the association met again at Pittsburgh; met to round out—smooth off the corners as it were—of their initiative effort, and on July 1, 1890, held, what was rather incongruously—matters of nativity considered—its *third*—so the annals say—annual convention. However that does not matter. It simply brings us to the

FOURTH CONVENTION,

held at St. Louis, Mo., beginning Tuesday morning, May 12, and continuing, with the usual interruptions of pleasure and profitable sight-seeing, until Thursday evening, May 14.

One reason, no doubt, for holding the convention this year at St. Louis was because wide-awake St. Louis boiler manufacturers put in so strong an oar at the organization of the association, and have worked so faithfully in its interests since; worked to the end of perfecting the organization and harmonizing any apparently conflicting interests.

Another reason was, there is quite as little doubt, because the members knew that St. Louis was an excellent place for such a convention; that while deliberation was in order there was nothing the matter with its surroundings, and when hospitality came to the front there was solid reputation to back any assumptions that might be made.

To whatever extent this last-named consideration was operative in the selection of a place of meeting, those who were influenced by it made no mistake.

THE SESSION TUESDAY MORNING.

At exactly 10:15 A.M. the sound of President Lappan's hammer called to order the boiler manufacturers assembled in the auditorium of the Lindell Hotel. As an opening wedge to the proceedings the president made a short and appropriate address. He advised his hearers that it was well for them to be present; that each of them would be repaid if he could gather a few points of information. He thought that what the association had already done was well received by the public, and hoped this would continue to be the case. Boiler makers were not in a prosperous condition. Almost every class of the people, including farmers, raised prices; boiler makers did not. He advised all boiler makers to stand by the organization.

After the usual formalities, the secretary, Col. E. D. Meier, of St. Louis, explained that the usual grumble of those who did not attend the meetings of the association had been heard in its customary prominence; he then excused himself from reading in their entirety the minutes of the last meeting, at New York, which covered 170 pages of closely written matter, and read the minutes by title.

Mr. Garstang, of St. Louis, welcomed the members and hoped for the growth of the organization. Methods had changed; now men *manufactured* boilers where formerly they *built* them. A person could whittle at a stick and finally make something of it, but modern machinery would accomplish the end in a fraction of the time. Boiler manufacturers must keep up with the march of events.

Mr. Douthett responded in his usual eloquent manner. Individual voice, he said, was too feeble; concerted action was necessary in the interests of boiler manufacturers. The keynote had been struck in forming the organization; it was necessary only to continue the work.

CHIEF ENGINEER MAGEE'S REPORT.

Under previous consideration, Mr. E. A. Magee, Chief Engineer U. S. Navy, was present, by government appointment, at the New York meeting of the association. At this meeting his report to the government officials was read. In it he spoke in high terms of the efforts of the association, and paid a tribute to skilled labor in boiler making. He touched various economical matters connected with boiler manufacture, the general drift being in favor of the employment of skilled labor, paying it for the skill it had acquired.

One concern adopted the plan of increasing the wages of desirable employes twenty-five cents a year for two years; if not found desirable men their pay was put back. The whole intent was to give good workmen what they are worth, and we have no doubt but that its general adoption would result in better boiler work.

FINANCES.

The secretary reported the unfortunate absence of the treasurer, but he had forwarded his report. Without entering into details, it will be sufficient to say that the finances of the association are in a healthy condition—not booming, but showing a balance of more than $500 on the right side.

BOILER SETTING.

The committee on boiler setting had nothing new to report. This committee made quite an exhaustive report at the New York meeting, embracing replies from a number of manufacturers to whom inquiries had been addressed. But as the committee considered only the return tubular boiler, it was thought advisable that it continue its labors till other types of boilers were embraced in the report. The report so far was considered as lacking in breadth. There was not lap enough to it, so to speak. It was laid over indefinitely.

BOILER INSURANCE.

Something like a warm shell from an enemy's battery was thrown into the assembled boiler manufacturers by bringing up the boiler insurance feature; the feature that caused some contention at the New York meeting. After some talking and one or two motions, the president, quite wisely, it seems, ruled that this matter was entirely outside the association, and hence no motion in relation to it was in order, and no discussion of it was permissible. Motions in relation to it after this decision of the chair, from which no appeal was taken, were not entertained. It is quite evident that any boiler insurance company, made up of members of the Boiler Makers Association, will have to stand on its own merit, receiving no more friendly recognition than is accorded to any insurance company; the A. B. M. A. has no quarrel, so far as could be learned, with any honest boiler insurance company, and will consider one whose members belong to the association strictly on its merits. Some of the friction on this subject, at the New York meeting, could have been avoided, in view of the present action of the convention.

UNIFORM BOILER INSPECTION LAWS.

There was no uncertain sound—not from a single member—as to the advisability of stringent inspection laws; laws that should not only provide for the inspection of boilers, but inspection of the men who operated them. No boiler manufacturer present at this meeting opposed such action on the part of the convention as would place boilers of his make open to the most rigid scrutiny as to material and workmanship.

A communication, which took the form of a bill which it was proposed should be submitted in the various States for legislative action, the idea being that uniformity in this respect should obtain—a very good idea, indeed, and one against which it will be hard to bring valid argument.

As there is no probability that the bill would pass a single State legislature without material modification, there seems no occasion for giving it complete; but as its main features must be embraced in any bill that will accomplish the purpose aimed at, a few of its more salient features may be outlined.

For example, it provides that all plates of which boilers are constructed shall be stamped on each of their four corners—about twelve inches from the actual corner—with the name of the manufacturer and the tensile strength, the quality of material, and the symbols of the Boiler Makers Association.

All boilers of over five horse-power must be inspected once each year, hydrostatic test to follow each inspection, the practice in United States inspection, practically, prevailing. After a boiler has been in use six years it shall be inspected twice each year; but a hydrostatic test need not be made but once in the year.

All persons in charge of boilers must notify the inspection officers every three months of the condition of boiler or boilers in their charge, and all men having the care of boilers must pass an examination as to their ability to perform the duties devolving upon them, the examinations being graded as between boilers of thirty horse-power, or less, and those of larger power.

Boilers insured by insurance companies, and regularly inspected by the officials of these companies, shall be exempt from State inspection, but the company's inspectors must report to State inspectors—a very good feature—as to the condition of boilers they inspect. Furthermore, if it is believed that the inspectors of the insurance companies are remiss in their duties of inspection, the State inspectors may exercise their prerogatives to inspect. Boiler insurance inspectors must pass an examination the same as State inspectors, as to their ability to perform their duties.

PLACES INSPECTION IN THE HANDS OF BOILER MAKERS.

Inspectors must have had at least seven years' experience as boiler makers, and must possess the other necessary qualifications. The chief inspector must be not less than forty years of age, and assistant inspectors not less than thirty years.

Various other things are provided for in the proposed law, such as fines to be imposed upon manufacturers and users of boilers, and engineers, for failing to comply with the provisions of the law, but, as previously intimated, the text is not given complete, for the reason that such a law before enacted must run the gauntlet of two or more political machines that always join forces to modify—or more generally to defeat—any proposed legislation relating to steam boilers. We trust the boiler manufacturers will succeed in getting a suitable inspection law passed by every State legislature, and signed by the Governor. Perhaps they may do so by joining forces with other bodies working to the same end, making up a combination of sufficient magnitude to convince politicians that there is a larger "pull" for such a law than there is against it. At any rate, the Boiler Makers Association has placed itself on record as unequivocally—most emphatically, in fact—favoring such a law, of which fact, other organizations like minded may take advantage. Finally it was decided that the committee should report further on Thursday.

THOUGHT BOILER MAKERS WERE IGNORED.

A communication from Patrick F. Dundon was read, which referred to inspection, and also to the apprenticeship question, which latter question had been referred to a committee at a previous meeting.

The writer thought that in mechanical matters boiler makers were ignored. When it came to things above shop work members of some other trade were put in position to pass on boiler making methods. There seemed but little inducement for boys to perfect themselves in boiler making. Boiler makers must stand up for themselves. If something were left open for them there would be more expert craftsmen in the business. Inspection laws should be established, and inspectors who were boiler makers should be appointed to the positions created. By this, and similar methods, boiler makers would, like other mechanics, see the possibility of something ahead.

WELCOME FROM THE PRESIDENT OF THE CITY COUNCIL.

His honor, the Mayor of St. Louis, sent a letter regretting his inability to be present to welcome the boiler manufacturers, and in the usual conventional terms placed the city at their disposal. The president of the city council was, however, deputed to do the welcoming, which he accomplished in a very neat and appropriate manner. Press of business, he said, prevented him from giving that attention to the subject that he would like to give, but a St. Louis man could always extend the hand of fellowship. He was one of thirteen who had to pass upon the appointments of the Mayor, and with only about two thousand appointees his time was pretty completely occupied. His remarks in this respect showed that the rush for petty city offices—requiring in the main no especial ability to fill—is as great in St. Louis as elsewhere. What he said was well received.

A communication from F. E. Leonard was read, in which he offered two resolutions; one was, as the AMERICAN MACHINIST man understood it, that no patent boiler men should be permitted to exhibit in the meeting room of the association. This seemed to be misconstrued into an attempt to prohibit any manufacturer of patent boilers from presenting anything in relation to them to the convention, and was most emphatically sat down on. We are inclined, however, to the belief that what was set down on was not what Mr. Leonard wrote, but what it was thought he meant to say. We incline to the belief that if the showing of every manufactured article on the convention floor was prohibited a material point would be gained.

Mr. Leonard heartily approved the efforts of the associations of stationary engineers to bring about inspection and license laws.

The reports of various committees were made the order for the sessions of Wednesday and Thursday.

Representatives from the U. S. Navy, from boiler inspection and insurance companies and State inspection bureaus were present, and were invited to participate in the discussion of questions in which they were interested.

PLEASURE-SEEKING TUESDAY.

Tuesday afternoon, carriages were in waiting to convey the members of the association and their friends to one of the greatest—probably the greatest—brewing establishment in the world, the Anheuser-Busch Company's works. Here the members of the association, whose great interest centers in the production of heat, saw what an easy matter it was to nullify their efforts by the production of enormous—by comparison—cold; an operation in which they were, of course, interested.

The afternoon trip embraced, also, a visit to various other places of interest in St. Louis, a lunch, and a visit to the theatre in the evening.

WEDNESDAY'S PROCEEDINGS.

When the association gathers strength by virtue of more years of existence, there is little doubt that it will be called to order promptly at the time set for convening instead of nearly an hour late—almost eleven o'clock—as on Wednesday morning. President Lappan was ill at ease at the tardy appearance of the members, and undoubtedly he or his successor will see that delinquent members miss the opening proceedings in the future. It would be a good thing to do, as encouragement to members who, believing in being on time, waste an hour or so waiting for laggards.

The first subject, after the reading of the minutes of the session of the day before, was the report of the committee on

MATERIALS AND TESTS.

This committee was not fully prepared to report. The rules governing these matters must conform to local requirements, and at least two standards were before the committee. One was the United States requirement, and the other what was known as the Philadelphia practice. While the United States government did not take cognizance of strength of sheet after rivet holes were deducted, Philadelphia practice did. Government practice would space rivets too close; Philadelphia practice too far apart.

The government practice was defective, in that diameter and pitch of rivets were practically ignored. Determinate tests were necessary. Hollow stay bolts were advocated as giving greater proportionate strength to the threads. The committee wanted the matter laid over until the report on riveting and calking was presented and thoroughly considered.

RIVETING AND CALKING.

The efforts of the committee added little to what had been presented at previous meetings. The action of Mr. Connery (of the Baldwin Locomotive Works) in placing at the disposal of the members of the association his well known patent on concave calking, was duly appreciated and acknowledged.

MACHINE OR HAND RIVETING.

The battle royal was between the advocates of machine riveting on one hand and hand riveting on the other hand. And this battle showed how widely divergent the opinions of members as to the comparative merit of the two systems were. The committee, in a faint way, but still pronounced enough to indicate fairly positive opinions of its members, favored hand riveting. It appeared to this committee that it was simply a question of more work when machine riveting was employed. It may, in fact, be said that the committee spoke slightingly of machine riveting, without giving any very tangible grounds for their opposition.

In discussing this report Mr. Rohan did not believe in passing over the matter of riveting with so small consideration. Machine riveting was in the nature of progress, and if the committee had found hand riveting better it ought to tell the convention why, and to what extent. Generalities were not sufficient.

Mr. Matthews, of the committee, admitted that enough consideration had not been given the subject; it ought to be laid over for further investigation.

Secretary Meier thought there might be conditions under which machine riveting would be best, as in the instance of very thick plates and large rivets. He did not know of any comprehensive tests having been made to determine the relative value of machine and hand riveting. He thought a shell, say four or five feet diameter, should be made, in which were both hand and machine riveting, then test this shell to determine the relative merits of the two systems.

At the same time the strength of manholes and manheads could be tested.

Mr. Rohan did not wish to disparage the work of the committee, but committees must expect to be criticised in the interests of improvement. He did not believe in very much going outside for facts. These facts ought to be established in the organization. The committee had had too little time.

Mr. Matthews thought it was not possible to do always with a machine what could be done by hand work.

Other members thought machine riveting had come to stay, and that the association could do better work by giving its attention to the best methods of machine riveting.

As opposed to this view it was urged that what the association was interested in was the determination of the best way of riveting, without regard to cost.

Secretary Meier advised that the committee be empowered to get riveting done by both methods—seams of considerable length—and have them submitted to a sundering test.

After a good deal of discussion pro and con it was determined to continue the committee, somewhat enlarged (in opposition to the truism that large bodies move slowly), and that this committee be empowered to make tests at the expense of the association.

Secretary Meier agreed with a dissenting number, who reasoned that a shell of composite riveting—hand and machine—would not be satisfactory, but that one of each should be employed.

After a good deal of discussion, about evenly divided in opinion as between hand and machine riveting, the committee was instructed to make tests, and report at a future meeting.

WEDNESDAY AFTERNOON.

At the beginning of the afternoon session a telegram was read from the National Boiler Makers Union, in session at Indianapolis, to the effect that a resolution had been passed by that union, sanctioning the employment of one apprentice to every four boiler makers; this was well received by the manufacturers.

BOILER TUBES.

The subject of boiler tubes was the first in the line of regular business. Mr. Wm. P. Tyler, president of the Tyler Tube and Pipe Co., of Washington, Pa., appeared on this subject, his remarks being reinforced by a number of specimens. He said his company were obliged to move from Boston to Pennsylvania because it could not get a pound of charcoal iron in Boston. There were only four firms in Pennsylvania making charcoal iron, and this could only be had by those who were in the ring. So his company had to manufacture the iron it used.

A very good tube could be made from common iron, with the ends properly annealed, but it would not stand heat like the tubes made of charcoal iron. This he illustrated by exhibiting two tubes—one from each kind of iron—that had been subjected to the same heat. The charcoal tube was not injured, but the tube from common iron was decidedly used up. Boiler manufacturers, Mr. Tyler said, could have any kind of tubes they wanted, but tube manufacturers wanted to know what they required.

Mr. Tyler was followed by Mr. Coit of the National Tube Works. Mr. Coit did not attempt to advise boiler manufacturers as to what kind of tubes they should use, but stood ready to furnish just what was required. The company made a great variety of tubes for special requirements, as peculiarities in the water used, and other considerations called for different grades of tubes. There had been some demand for steel tubes, which were furnished when required; in fact, there was nothing in reason that boiler manufacturers might require, that would not be furnished.

After some discussion by the members the question of tubes was referred to the committee on materials and tests.

SAFETY VALVES AND HORSE-POWER.

The committee on manholes and manheads, having nothing additional to offer, safety valves and horse-power was taken up. The secretary read the report of the committee. In effect, this committee recommend the use of spring-loaded safety valves, of the "pop" type. Capacity should be sufficient to discharge 50 per cent. more steam than indicated by the nominal power of the boiler. It was advised that valves larger than 4" should not be used; where capacity in excess of this was required, more than one valve should be employed.

The report on horse-power submitted at the New York meeting was then discussed. In this report it was recommended that the evaporation of 30 pounds of water per hour, from and at 212°, be considered a horse-power. For plain cylinder boilers it was advised that 7 square feet of effective heating surface be considered equal to one horse-power; for horizontal tubular boilers, 12 square feet; for upright, 8 square feet, and 8 square feet for boilers of the locomotive type. Discussion was upon what should be considered effective heating surface.

Secretary Meier thought the old rules discriminating as between different parts of the heating surface were absurd; other members thought that any rule adopted should take into account the heating surface as a whole, and should be so plain that all would understand it, to the end that much trouble from differences in opinion as to how much heating surface should be allowed per horse-power should be avoided. Finally, the report of the committee, so far as it related to safety valves, was adopted, and the matter of horse-power was referred back to the committee for further action, some new members being added to the committee.

During the day, Mr. Ritchie, of Hamilton, Ohio, chairman of the machinery committee of the World's Fair, made a brief address before the convention on topics suggested by his official title; Mr. Torrey also spoke briefly on his bankrupt bill, now before Congress.

At the close of the afternoon session the members were taken out for further sight-seeing.

THURSDAY MORNING.

A paper from F. E. Leonard of Toronto, Canada, on

DRIFT PINS,

was presented. The author argued that the drift pin was a much abused tool; inspectors took satisfaction in sitting down on it, and engineers never tired of giving a much abused tool of the boiler maker a bad name. Inspectors and engineers abused it on general principles. But it was an important implement in the hands of a competent boiler maker. Its use could not be dispensed with, except that all sheets were drilled after being formed to shape.

No members of the association appeared in favor of Mr. Leonard's use of the drift pin, and none opposed its use. It was a case of letting well enough alone.

UNIFORM BOILER INSPECTION.

This subject came up again to hear the report of the committee, as previously referred to. The report took the form of some features that it was thought advisable to have presented to State legislatures, or to Congress, in the effort to secure uniformity in inspection. One of these features is that boilers shall be rated as 1st, 2nd, 3d and 4th; the 1st embracing only boilers made according to the requirements of the association, and the other grades covering boilers made of inferior materials, such as lower grades of steel and iron plates and cast-iron. Penalties for failure to have boilers properly stamped, showing their grade, or failure to stamp correctly, are provided.

This report provoked a great deal of rather warm discussion. Some members were in favor of recognizing only one grade—the association grade—of boilers, and it was rather conclusively reasoned on the other hand that no bill containing such provision could pass any State Assembly in the country. Members of the committee asked for the fullest consideration of the report; they did not believe it to be infallible; but little time had been given them in which to do their work.

The discussion then waxed warm again, several members claiming the floor at once, offering amendments and suggestions. Finally, Col. Meier took the floor and showed, in a remarkably clear and forcible speech, the folly of trying to accomplish the impossible. Other boilers, he said, than those fulfilling the requirements of the association were made and would be made. The association would continue to recommend, and its members would build boilers according to the provisions of the association. Further than this they could not go, except to secure the rating of boilers. Men would buy such boilers as they choose; providing for their rating would give them an idea of what they were buying. After much talk and no little confusion, in which the president was fully occupied in keeping a dozen members from speaking at once, Mr. Douthett offered a conciliatory amendment to several other amendments, which amendment recited the fact that boilers of the lower grades would be built, but the American Boiler Makers Association recommended the No. 1 type.

Matters finally settled down to a fair basis, and the association felt relieved.

AFTERNOON SESSION.

Those who have had any experience with such a town as St. Louis will not fail to understand that not much business can be accomplished on a trip on the river. The big-hearted Western men have too much in view for the pleasure of their visitors. Still the association came to order—some kind of order—on the boat, and discussed various things connected with their business.

One of the things discussed was the question of gauges. Without the intention to interfere, the AMERICAN MACHINIST man would propose that the association cut the knot at one clip of the shears and adopt the Brown & Sharpe or some other standard of actual measurement. What is the use of bothering with such matters when absolute measurements can be made within a fraction of no practical importance?

Other matters were considered, and the sessions closed in good form and harmony.

INCOMING OFFICERS.

The officers elect for the following year are: President, James Lappan. It ought to be stated that Mr. Lappan declined after election, but his declination was not accepted. President Lappan, by virtue of what was expected of a president of such noisy men as boiler manufacturers, was retained against his will. There is no doubt about his filling the office in a manner satisfactory to the members. For treasurer, Richard Hammond was elected without opposition. For secretary there was no one in opposition to Col. E. D. Meier; some time the association may find a man who can fill his place, but it will be a hard job. Right here it may be said that no man in a responsible position ever filled up all the corners better than he. The association is level headed in retaining him.

Phil Rohan was elected as first vice-president. No better selection could have been made. When called upon to take the president's chair he fills it full, and his suave, though prompt rulings make him extremely popular.

Mr. James Kinny was elected second vice-president, and Charles Kroeschell third. The officers are all good men for their places.

The remarks of Mr. McLennan, boiler inspector for the district of St. Louis, who spoke by special invitation, were most excellent, showing that he grasped the whole subject of boiler inspection. These remarks will doubtless appear in the minutes of the association.

The next meeting of the association will be in Buffalo, N. Y., beginning the second Tuesday in June.

Bearing upon the question of trade knowledge making a man a good citizen, it is worth noting that Prof. Ely, in the *North American Review*, states that once in London, when some large relief scheme for distressed people was in progress, 1,000 men applied for relief before one mechanic applied in one of the districts, and of all who applied in that district none was a member of a trades union. There may, of course, be other special causes tending to bring about such results, but, with all discount, the figures are very striking.

LETTERS FROM PRACTICAL MEN.

An Equalizing Driver.

Editor American Machinist:

I have in use an equalizing driver for very small lathe work that may be of interest to those of your readers engaged in that line. It is for turning light shafts between female centers, and would not answer for work of a heavy nature. Those who wish a stronger device are referred to that of Mr. A. B. Landis, in your issue of April 10, 1886. Mine has the merit of being easily constructed, and the two driving arms may be turned to one side at any time to use an ordinary bent-tailed dog, if desired, without removing any of the parts.

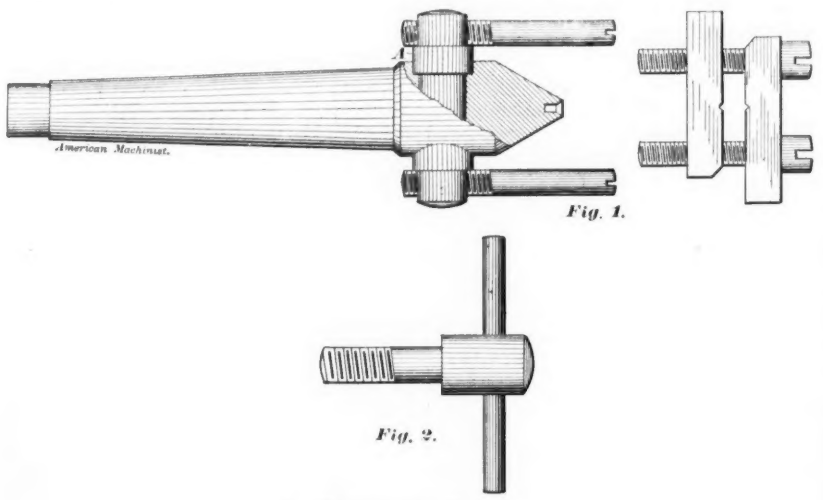


Fig. 1.

Fig. 2.

AN EQUALIZING DRIVER.

Fig. 1 shows the lathe center with driver, and also the dog. The latter is quite an ordinary affair, made of two straight pieces of square steel and two screws. If any one wanted to balance the dog for very high speeds, one of the screws might be turned end for end, so as to make all the parts symmetrical about the work axis, but that would make it inconvenient to put the dog on and remove it from thework. The driving part I made by drilling a ¼-inch hole crossways through the live center, and inserting a piece of ¼-inch drill rod, with a hole tapped crossways through each of its ends to receive the two driving arms. I threaded the latter in order to adjust them to varying positions of the dog on the work, but in actual practice find I seldom have to adjust them, and, if making another one, would drive them in. The loose washers *A* are to hold the two driving arms at equal distances from the center, the latter being counterbored a little on each side to afford the washers a seat. The cross-shaft should be a close running fit, and the driving arms, if threaded, should screw in rather tight.

While speaking of drilling crossways through a shaft, I might mention how I accomplish the same without any accessories, if it is a job where "near enough" will do, and the hole to be drilled is quite small, as the screw holes for the driving arms in Fig. 1, for example, or the cross-bar of the screw shown in Fig. 2, which is a quick way of making a thumb-screw out of straight stock. After center punching the shaft or rod, and attaching a dog to some part of it, by which to hold it in the desired position, I lay it on a parallel block on the drill press table, and drill the hole. If the point of contact between the rod and block is not in line with the drill spindle, a tendency of the rod to roll will be detected by the left hand that holds it, and the rod may be shifted along on the block accordingly.

A very important item in the operation is to have the drill projecting as far as possible from the chuck, so that it will bend to one side under a slight provocation, and thus enable the operator to more readily feel the rolling action of the rod he is drilling. Any one trying this for the first time will be surprised to find how near the center he can come. The essential conditions are, however, a long, slender drill that runs tolerably true, and ordinary sensitiveness of touch in the operator.

WALTER GRIBBEN.

Ten or Twenty Horse-power Engine.

Editor American Machinist:

I may be a little late in the discussion of G. G.'s ten or twenty horse-power engine, but with due respect for Mr. Odell's plan (which, by the way, I think is all right from his standpoint), I will relate a circumstance which came under my notice lately, that appears *apropos* Mr. Schneider's bushing:

A party had a great big engine which he had used for driving a lot of wood-working machinery, which he had tired of and sold, and substituted some machine tools with which he proposed to run a machine shop, but still having the engine on his hands, he naturally wanted to use it to the best advantage. Now this old engine used to require a couple of boys to shovel in coal in order to keep the machinery up to speed, and he thought that by putting in a bushing into the cylinder, so that it would figure up to about the horse-power it would ordinarily take to run a country machine shop, he could economize; therefore, he had the bushing put in. If I remember aright, the cylinder was 12″ bore, and after figuring, it was concluded to make a bushing of 6″ bore; this was done, and the engine ran as a 6x18 for some time, but was ultimately abandoned and a smaller engine used. The idea was at the time, that the bushing could be taken out, and the engine used as before, or sold for what it would bring at second-hand; but fate ordained otherwise; the old engine has just been sold for fifty cents per hundred for old iron, and the shop is now running with an old second-hand portable. Thus much for bushing cylinders.

I believe that if I were placed in G. G.'s place, I should rather have a second hand 20 horse-power at the end of five years than a 10 horse power, because I think that there might be a great many times that I should use more than 10 horse-power, even in a small business, and the market value does not depreciate as much on a large engine as it does on a small one with a few years' use, provided it has not been run by some "pseudo engineer" who is too free with his monkey wrench.

J. A. GILKERSON.

Lead Burning.

Editor American Machinist:

Replying to Question 207, G. H., in your issue of May 7th, I take pleasure in giving such directions as will enable any mechanic to burn lead with a little practice. The art seems to be very closely guarded, and few are taught it; in fact, it is made a sort of family affair, being handed down from father to son, through several generations.

The process which I shall describe is for through burning, and not surface burning. The flame used is hydrogen gas mixed with air under pressure. This melts the lead on each side of the seam, and forms one piece of the sheets. Strips of lead are used instead of solder. To burn flat seams, such as bottoms of tanks, floors, etc., butt the sheets closely together, and under the joint place a strip of common brown or grocer's paper, about 2 inches wide, scrape bright for ½ inch on each side of seam, also scrape the piece of scrap lead—which should be about 1 foot long, ½ inch wide, and say, ⅛ inch thick—or the thickness of the sheet to be burned. Regulate the flame to the weight of the lead, and let it play directly upon the seam, at the same time hold the piece of scrap in the flame, resting it on the lead just at the seam; when the melt takes place, quickly withdraw the flame, and allow to cool down; when sufficiently set, commence again at a point just in advance of the solid seam. By these repeated meltings and coolings you will form a lead to lead joint, which is as strong as any other part of the sheet.

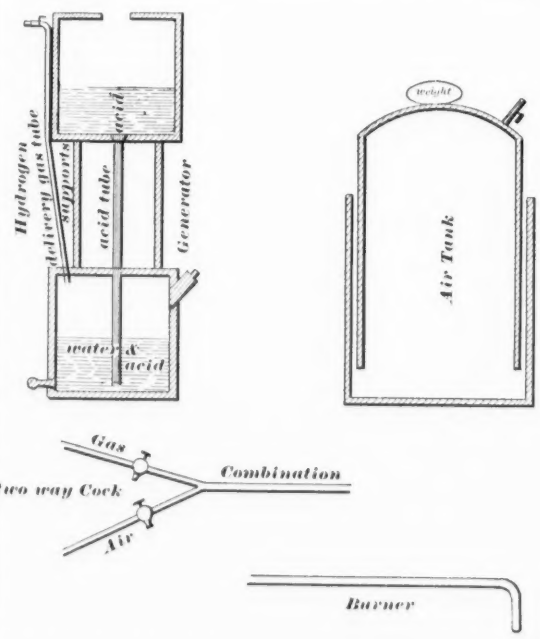
To burn upright seams, which is the most difficult, commence at the bottom and burn upward, melting and cooling as in the case of floor seams. When an upright joint is finished, it looks just as if it was shingled with round disks of lead, about the size of a cent, with about ½ the diameter of the disk to the weather.

To properly burn lead requires the following apparatus, which I shall describe *seriatim*:

The gasometer or air holder consists of two copper shells, one inverted inside the other, with the usual water joint, and a stop-cock on the top, to which is attached the air tube.

To give the requisite pressure, weights are placed on top of the cylinder; these weights vary according to the job to be done, from 20 to 50 pounds. The capacity of the holder for ordinary work is about 50 gallons.

The hydrogen generator is probably the most complex piece in the whole outfit, and I will describe one which has given universal satisfaction. It is made of sheet lead, with burned joints, and consists of a lower box about 1 foot square, an orifice at the bottom, closed by a wooden plug, for the purpose of drawing off the spent sulphate of zinc liquor, an opening in the top 1½ inch in diameter, near the edge, looking outward, closed by a plug, this being for the introduction of the feathered zinc and water. Above this, supported upon three legs (pieces of lead pipe 1 foot long) is another box of the same capacity as the lower one, but it has an opening in the top of about 6 inches in diameter; from the bottom of this box there leads an inch lead pipe down through the top of the lower box, and extending to very nearly the bottom, this being the pipe through which the acid is allowed to feed into the water and zinc in the lower box. From the top of the lower box is led a ½-inch pipe, extending upward, and attached to the side of the upper box; a stop is placed on the end, and to this is attached the gas tube. Extending this pipe upward allows all water to separate from the gas and deliver it in a dry state to the burner.



To start the generator, fill the lower box about one half full with water, and about 3 pounds of feathered zinc, *i. e.*, zinc melted and poured into cold water. Now, pour acid (*sulphuric acid*) into the top box, and, as soon as it reaches the water, gas will begin to come off, and, if the stop on the delivery tube be closed, the pressure will force the acid up into the upper box, and the action ceases, but, upon opening the stop, more acid will fall, and in this way an even pressure will be kept up.

The two-way cock consists of an air tube, a gas tube, with stop-cocks in each, and these combining in a delivery tube for the mixture of air and gas. This two-way cock is placed about 6 feet from the burner, and say 12 feet from the generator; you will therefore require two lengths of ⅜ to ½ inch gum tube to connect with air tank and generator, and another piece 6 feet long to connect burner.

The burner is an ordinary curved blow-pipe 6 inches long, with small opening for the gases, so as to give a pointed flame. The pressure of the air must be regulated to the size of the flame, and the size of flame to the weight of lead to be burned, for $\frac{n}{10}$ w lead a flame about ⅛ inch long is sufficient; heavier than this is apt to melt too quickly, or to burn the lead. With these tools, and a little practice, a very good job may be done, a little rough perhaps at first, but time and patience will enable the operator to do a neat piece of work.

JAW.

Burning Lead Joints.

Editor American Machinist:

In your paper of May 7th, 1891, I notice that one of your correspondents (Questions & Answers, No. 207), asks for information concerning "lead burning."

As I have had some little experience in this line, I advise him to give up all thoughts of doing it himself, and to employ a professional lead burner. He will find that it will save him money in the end. This is entirely outside of a plumber's business, and if one would be employed, the chances are he would make a bad job of it.

Lead burning is done by concentrating a flame on the edge of the two sheets of lead which are to be "burned together." If the flame is held at a point for an instant too long, it will melt the sheet to a thin edge, and if a union is obtained it will leave a thin spot just back of the joint, and this will be equivalent to using lead of a lighter gauge, on the same principle that the strength of a chain is equal to its weakest link. Acid always seems to find these thin spots, and finds its way through them in a very short time.

Again, if the lead is not sufficiently heated, an apparent union is made, but it will surely open sooner or later.

These are only two of the many difficulties the beginner will encounter.

The skill of a lead burner is shown by the regularity of his joint. I once had "a burner" do a job for me, covering a large drip pan, some 20 feet square, and six months later I was obliged to cut the lead at one point, and had quite a little hunt to find where the sheets had been burned together, the two contiguous edges being scarcely upset at all.

J. L. Morgan (47 Fulton street) and the Lodi Chemical Works (38 Platt street) keep one or more lead burners at their chemical works all the time.

If your correspondent buys his acid direct from the manufacturer, and if his tanks are small, I should advise him to send them to the chemical works, and let their regular burner do the job for him, but if the tanks are too large for this, maybe the chemical company will loan him their lead burner to do the job, or he can apply to one of the following names (professional lead burners):

Chas. E. Field, 119 John street (who has done most of the work in the U. S. Assay office, Wall street).

Wm. Craig, 363 Pearl street, and James Saunders, 184 Manhattan avenue, Brooklyn, E. D.

I wrote these addresses down some three years ago, and some of the men may have moved since then.

Your correspondent probably knows that

he should use "chemical lead" for his lining, and not the ordinary sheet lead.

Hoping this may give you the information you seek. ALBERT A. CARY.

That Traction Engine.

Editor American Machinist:

If the patience of your readers will permit, I will say a few words in explanation of the experiments which were made with the model described March 26th. The weight was intended to represent an amount about equal to the turning power available at the pitch line of the main driven gear in a traction engine where about 60 per cent. of the total weight is carried on the drivers. In this case, when the pinion is placed in front of the gear, as represented by Fig. *A*, the engine started ahead will have the effect of transferring the weight from the axle to the pitch line of the gear, bringing the point of support so much nearer the center of gravity that 75 per cent. of the total weight is not far from right.

With the pinion applied behind, the effect of starting the engine ahead is to increase the weight on the axle bearings until about the same proportion of the total weight is carried by the drivers, supposing that this is sufficient to overcome the resistance to moving ahead, and with the adjustable incline the resistance was adjusted so that 75 per cent. of the total weight just permitted the model to start and ascend the grades as shown.

Here, by the way, let me say, in reply to C. O. Sine's criticism of April 23d, that in the woods out here when we say 15 per cent. grade we mean 15 feet in one hundred, and not 15 per cent. of 360 degrees; if this grade is to be expressed in degrees it

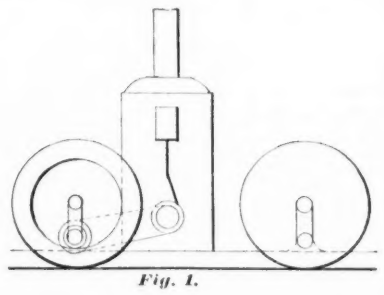


Fig. 1.

represents only about 8° 35′. The track was pine, the wheels of hard maple 4″ diameter, the drum representing the main gear 3″ diameter. The difference in the results of the method of applying power to a traction engine will be more clearly understood if Fig. *A* is imagined built so that the entire motor is suspended by links from the axles, as shown in sketch Fig. 1. When the engine is at rest the pinions are at the bottom; as soon as the engine is started, if the resistance is sufficient, the pinions will travel upwards on the gear until the weight has been transferred ahead enough to overcome the resistance, when the drivers will begin to turn and the axles to advance. In practice, on the road, I believe an engine which can throw the weight carried by the drivers, say 18″ ahead of the center of the wheels, will overcome obstructions more readily than one that is driven from behind, because the power of the engine is used in the latter simply to revolve the wheels with the center of gravity of the weight carried by the drivers remaining constantly over the center of the axle. The friction may be all there is of the difference, as Mr. J. G. Tramis indicates, and, if so, it is responsible for considerable, as an incident which occurred a few months ago in the western part of the State would show. They were hauling a stationary boiler, mounted on rather small iron truck wheels, by the aid of what I should call an eight H. P. traction engine, making fair progress until they struck a short hill, when first the drivers slipped, dug a hole in the ground, rather deeper on the right-hand side, lifted the front end of the traction boiler clear of the ground, swung around to the right, so that when the engineer shut off steam he was headed for the ditch, and with one wheel stuck six inches in the ground; this necessitated letting go of the tow, and, as the road was narrow, I suggested going to the top of the hill, turning around and hitching the traction so that it could back up hill. This shortened the chain so that he had to go through the bad spot with the load, but by careful steering it was passed without any trouble.

The chain was passed around the fire-box under the driving axle, so that the strain rather increased the weight on the drivers. The pinion on this engine is placed about 6″ above the center, and on the back of the gear, as it usually runs with the steering wheels in front. It is hard to say that the position of the driving pinion had anything to do with this case, still I think the hill was passed quicker than it would if the engine had not been turned around.

A. H. LEFEBVRE.

The Construction of Ellipses.

Editor American Machinist:

Attention was called in your columns a few weeks ago to the well-known trammel for describing ellipses, which is an ingenious arrangement whereby two points are made to travel in fixed grooves at right angles to each other.

Another device applied by the writer to his dividers several years ago, which will be recognized as a simple modification of a common method of drawing an ellipse, is herewith presented.

When a gardener lays out an elliptical flower bed, he drives two stakes *F* and *F*′, Fig. 1, into the ground, the distance between them being less than the length of desired bed; then a third stake *C* is placed

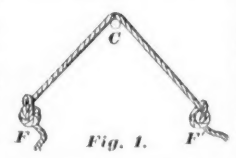
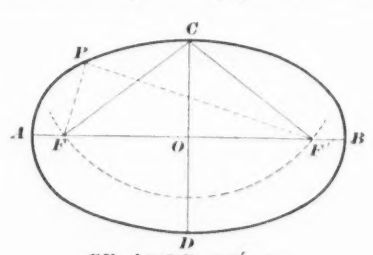


Fig. 1.

opposite the center of the first two at a point which limits the width of bed. Now a rope is tied at *F*, carried around *C* and again tied at *F*′. The stake *C* is then removed, and with a pointed stick held against the inside of the rope, so that it is always tight, one-half of the ellipse is marked out—the other half being obtained in the same manner.

The smaller the stakes at *F* and *F*′, and the finer the rope, the more exact will be the ellipse generated. Let us reduce the diameter of the stakes until they become mere points, and let the rope be reduced to a fine line which will not stretch, then, by using the same method employed by the gardener, we shall have practically a true ellipse; for, if we take any point on the ellipse, as *P* or *C*, Fig. 2, we shall find that the distances of this point from *F* and *F*′ are together equal to the length of the greater axis *A B*, which satisfies the properties of a true ellipse. This enables us to construct an ellipse of any given dimensions



CF=AO; PF+PF′=AB

Fig. 2.

just as soon as we know the length of its axes *A B* and *C D*, without guessing at the position of the points *F* and *F*′; for, if we draw the two axes *A B* and *C D* bisecting each other at right angles, and from the end

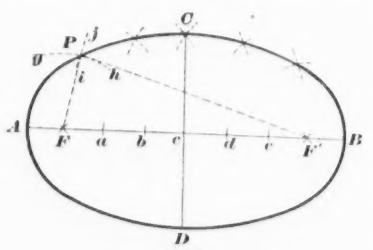


Fig. 3.

C of the shorter axis *C D* describe an arc with radius *A O* equal to half of the greater axis *A B*, it will cut the latter in the points *F* and *F*′, which will give us the *foci* of the ellipse.

Now divide the distance between the foci into any number of small parts, *a b c*, etc., Fig. 3; take *A a* as radius, and with *F* as

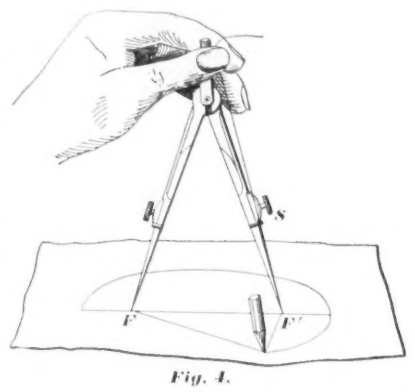


Fig. 4.

center, describe the short arc *g h*, also take *B a* as radius, and with *F*′ as center, describe another arc *i j* cutting the first in *P*.

It will be readily seen that the distance *P F* added to *P F*′ will equal *A B*, therefore *P* is a point on the ellipse; by proceeding in this way we can obtain a series of points which will determine the ellipse.

An easier method, after obtaining the foci *F* and *F*′, is to use an instrument for drawing the ellipse. The trammel previously mentioned is a good tool, but is not always accessible. A very handy ellipsograph is made from a pair of ordinary dividers.

If we drill the legs of a pair of dividers, or the removable points of compasses, with a needle drill (about a sixteenth of an inch from the point) and pass a fine silk thread through these eyes, we have a cheap accurate ellipsograph, and the dividers are not impaired.

Fig. 4 shows this instrument and the method of using it. The thread is first passed through the needle holes from the outside of one leg, then the inside end is knotted; it is then passed through the outside of the other leg, and the loose end carried up to the fingers, where it is held as desired. The pencil is sharpened as shown at *a*, Fig. 5, with a notch or fine groove, about a sixteenth of an inch from the point, for the thread to slide in—a small file will give the desired notch very quickly. For inking in the ellipse, a small hook can be attached to any right line pen, as shown at *b*, Fig. 5, and very fair work can be obtained by its use.

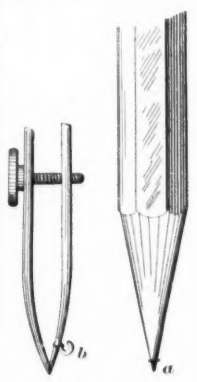


Fig. 5.

If several ellipses of the same size are to be drawn, the thread can be wrapped around the connecting screw *s*, instead of being held in the fingers.

It will be noticed that only one-half of the ellipse can be drawn without changing the position of the instrument.

J. J. FLATHER.

Thinks It is a New Gear.

Editor American Machinist:

In your issue of May 7 a gear is shown on page 3, which, I believe, is new, and I would like to ask through your columns if any of your readers have seen a gear of this kind.

I know that a worm has been used to drive a face gear, but in the gear shown the face gear drives the pinion, which is the ordinary tangent gear, and either the face gear or the pinion could be used as the driver.

J. H.

A One-Tooth Pinion—Self-Locking Rack and Pinion.

Editor American Machinist:

In '72 or '73 I had occasion to reduce motion "right smart" in small compass for the feed on a drilling machine.

I accomplished the purpose very successfully by putting an internal gear on the feed screw, and a one-tooth pinion on the end of the drill spindle.

The pinion *p*, Fig. 2, is made like a balanced crank, while the wheel teeth are extra long, and are circumscribed by the arcs, as shown, into which the heel of the pinion swings, while the pinion tooth passes to the next space.

During the incubation of this invention my beclouded intellect was braced up by an occasional hint from that clear-headed engineer of the Buckeye Engine Company, Mr. J. W. Thompson, while the machine work was splendidly done by Mr. Jesse Warrington, then a leading machinist in the Buckeye Engine Works, and now, I believe, engineer in the Nordyke & Mormon Works, at Indianapolis, Ind.

In 1874, I believe, I showed Mr. Cooper, then superintendent of the People's Works, Philadelphia, a sketch of this device.

In 1876 I saw in the "Centennial" a soap-stamping machine, with a "new mechanical

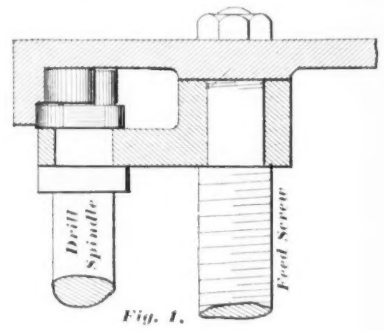


Fig. 1.

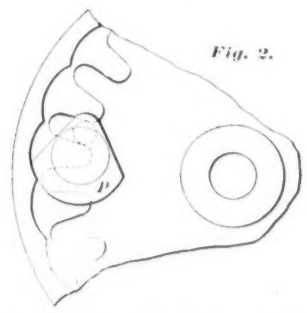


Fig. 2.

movement" by Mr. Cooper. The "movement" was my modest little invention. It goes that way sometimes, but I don't much mind, as I have invented many worse things since.

About 25 years ago, at Ottawa, Canada, I had occasion to design a suspension drill. The machine was a success, though perhaps the only novelty about it was the rack and pinion arrangement to slide the column up and down. The object was to make a rack and pinion which would be self-locking to prevent accidents from the column coming down on the run.

It was accomplished by making a two-toothed pinion and rack as per sketch. Fig. 1 represents the pinion teeth in section,

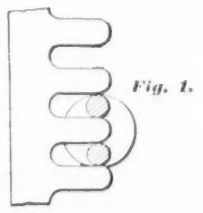


Fig. 1.

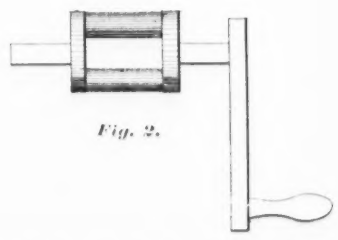


Fig. 2.

showing the rack locked. The handle is put on as in Fig. 2.

This rack and pinion has been extensively copied and applied to gates of water wheels, and many other purposes.

BENJ. F. WILSON.

The London *Engineering* for May 1 describes a new method of making weldless steel chains from a bar of cross-shaped section, which is drilled through diagonally and the links shaped under presses by punching and shearing.

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The Electric Motor and the Steam Engine Trade.

Progress in the development of electric motors has already been sufficient to enable prediction, in a general way, to be made with considerable certainty as to the effect on the future of the steam engine trade, although future progress, for which there is room, and of which there is probability, may modify to some extent present conclusions. Of course it goes without saying that it is only the writers for the daily press, who, as a rule, get rather hopelessly tangled about everything connected with mechanical and engineering matters—only these writers, and some over-zealous people, whose enthusiasm overrules their judgment, that see in the electric motor something that is to supersede the steam engine. There is no room for argument with those whose imagination makes of the electric engine a prime mover, still it is a fact beyond question that in one branch of the steam engine trade the electric motor is making its influence felt, and everything points to the conclusion that it will continue to do so in an increasing ratio, as it yields to probable improvement in construction and management. That is, in the trade in small steam engines.

There has been in late years a steadily increasing demand in manufacturing cities and towns for small steam engines. Much light mechanical work formerly done by hand is now done through the aid of small power plants, generally because the cost is cheapened thereby, and incidentally because the wear and tear of human muscle is economized. It is from this field that the small steam engine is being slowly driven by the electric motor. The virtual failure of the underground system of steam distribution for motive power leaves the field pretty fairly open to electricity. The making of steam on the premises, and the operating of a steam engine where a few horse-power only is required, is generally costly, and in other ways unsatisfactory, giving the electric motor a decided advantage in that the power is furnished from central stations of large capacity where the processes of making and using steam are much more economically carried on.

But steam engines, if not of small power, then of large power, will be required more than ever, because of the employment of electricity as a connecting link between the motive power and the work to be done, if for no other reason, because the greater convenience of the electric motor, less space occupied, and considerations of cleanliness and fire risks, will, in cities, multiply the use of small power by leading to its employment in thousands of buildings where it is not now employed.

And as the introduction of electricity into smaller towns goes on, it is reasonable to expect that the use of small steam engines will be further lessened, and by the more common use of electric motors—extending quite extensively to private houses for all that can be foreseen, in most of which there is, at least, a sewing machine to be run—there will be more than an equivalent increase in the use of large power, distributed from a few centers.

Just what proportion of steam engines from one to ten horse-power sold in cities and large towns where their use is being disputed by the electric motor bears to the total of such engines manufactured is not known, but it must be large. Neither has the use of electric motors arrived at that stage where it is possible to estimate how large power for a definite purpose—varying, of course, with conditions—can be more economically supplied by electric companies than from a boiler and steam engine on the spot; neither this nor the extent to which electric plants will be extended to smaller towns is known. But enough is known to make the prediction safe that the increasing use of electricity will have a material effect in lessening the use of small steam engines in certain localities, and increasing the total power supplied by steam engines in the same localities, the loss in one direction being more than offset by the gain in the other direction.

Shop Rules.

We find in a weekly paper published in a Western manufacturing town, an article in which the citizens are congratulated on the fact that the shops and factories of that town are filled with men who are in every way desirable citizens, and are universally respected as such, and that a feature worthy of special commendation is the gratifying absence of long sets of iron-clad rules, as "are so common in the East." A somewhat familiar acquaintance with the shops of that town and the men who work in them enables us to say of our own knowledge that for efficiency—value of product per man employed—these shops will compare very favorably with any others, and it is exceedingly doubtful if the most stringent rules would improve them in this or in any other respect.

A short time ago a man who is undoubtedly one of the best and most successful shop managers in this country, and who at present is at the head of an establishment employing about 1,200 men, was telling us of some changes which he contemplated making in the works, and among other things he said, "I am going to take down all the framed rules, and have no shop 'rules and regulations' whatever. I am convinced that they are not only useless, but worse than useless, and we shall be better off without them."

In Philadelphia there is a large shop enjoying a world-wide reputation, and in which shop methods, system and discipline have been closely studied. It is safe to say that there are few, if any, shops in which the efficiency of the men and tools is higher. There are no shop rules there, and never have been, and a member of the firm said the other day that it was the intention to have men in charge of the different departments who would know whether or not the men under them were doing the fair thing, and who would not hesitate to get rid of any who were not disposed to do right, or were not intelligent enough to know when they were doing right.

We know of shops where the efficiency is very high that have sets of rules, but we have not yet found any one in these shops that seemed to think their success was in any way due to the rules; while we have found men who declared their belief that their success in management was partly due to avoidance of set rules, and to dependence upon other methods to secure order and discipline.

We all know of cases in which run-down shops have been much improved in every way by new management, and in which one of the first things done by the new manager was the posting up of elaborate "rules and regulations," but it might be found upon investigation that the rules had nothing whatever to do with the improvement, while the personal inspiration, oral directions to foremen and others, with perhaps the discharge of a few stupid or unwilling and obstructive men, had done everything.

These facts seem to us to be very suggestive, and it may be well to stop and think whether or not a good deal of printers' ink and picture frame molding have been wasted in an attempt to do with them what can really only be done by entirely different means.

Any intelligent mechanic who goes to work in a new shop knows that, if he is on time, and in his place, strictly attends to his own business, and does his work to the best of his ability, he need have no fear of violating any shop rule, and need not take the trouble to read them, while, if he does not so conduct himself, he knows he is not doing right, and needs no rules to inform him of the fact. Just here a good foreman is required, and without him it is extremely doubtful if any possible rules will have any effect whatever, except to unnecessarily offend the dignity and self-respect of the best men—men upon whose good example the efficiency of the shop must largely depend.

A strike in the potteries at Trenton, N. J., has been settled after a fight of 21 weeks. The manufacturers attempted to reduce wages, and refused to treat with labor organizations. Finally concessions were made on both sides, and a settlement made which might just as well have been made in the beginning, thereby saving a good deal of money to all concerned. About 1,000 men were affected by the strike, but many of them have left the city during its continuance.

Literary Notes.

One of the most elegant publications that has come to our notice for some time is entitled, *Cornell University, her General and Technical Courses*, by Frank C. Perkins. It is handsomely illustrated, printed and bound, and contains in condensed form much information regarding the history and present features of this famous university. It is announced that the book will be sent to any address by the author, Mr. Frank C. Perkins, Dunkirk, N. Y., upon receipt of price, but, so far as we can discover, that price is not stated. The book is probably worth it, however, especially to the alumni of Cornell and others who for any reason have a special interest there.

The Third Annual Report of the Hebrew Technical Institute of New York has been issued, and shows the institute to be in good condition and doing a good work for the Hebrew youth.

The second number of the new periodical, now called *The Engineering Magazine*, has appeared, and contains a number of articles which can hardly fail to prove of interest to engineers and mechanics. Our friend, Mr. Samuel Webber, is the author of the leading article, which is on the subject of "Ancient and Modern Water Wheels," and this is followed by a variety of articles on such subjects as: "Epidemics and Water Pollution," "Danger Signals about the Boiler," "Building the Steamship in America," "The Tall Office Buildings of New York," "Our Old Fogy Methods of Reckoning Time," "Splendid Record of Electric Railways," etc. These are all illustrated articles, and are written in a popular style calculated to interest the general reader. That the new magazine is not to be strictly confined to descriptive or historical articles is shown by the publication of an article by Mr. William T. Croasdale, entitled, "Should the States Own the Railroads?"

There is a department of Engine-room Chat, and departments devoted especially to Architecture, Electricity, Mining and Metallurgy, and Mechanics, the latter being in the form of a familiar chat about recent ideas in mechanics, in which the mechanical papers are liberally quoted and credited. Altogether, the new magazine seems well calculated to make its way to favor, and by publishing articles written by experts, and yet in a more popular vein than purely technical journals usually care to publish, may do much to popularize engineering knowledge. *The Engineering Magazine*, *World* Building, New York.

MAXIMUM STRESSES UNDER CONCENTRATED LOADS, TREATED GRAPHICALLY. By Henry T. Eddy, C. E., Ph. D., Professor of Mathematics and Civil Engineering in the University of Cincinnati. Illustrated by twenty-five figures in text, and one folding plate. Reprinted from the Transactions of the American Society of Civil Engineers.

In this work the author introduces a new graphical method for determining what position a moving train of wheel weights must have in order to produce the greatest stress in any given part of the bridge truss or girder over which the train is passing. The method depends principally upon the construction and use of a class of polygons or curves, which have been named the reaction polygons. The proof of these constructions is given in algebraic form, or, rather, the graphical constructions are merely representations of the algebraic conditions for maximum stresses. The author has enlarged the algebraic theory by applying it to many cases not before treated, especially in cantilevers and double intersection trusses, but the principal object has been to show how the algebraic theory leads to convenient

graphical solutions of the equations of conditions for maximum stresses.

The book is published by D. Van Nostrand Company, 23 Murray and 27 Warren street, New York. Price $1.50.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(224) J. W. A., ——, Cal., writes: We have a mountain a few miles off and wish to know the distance to the apex. We would like a formula for working such examples. *A.*—You will find it in any good plane trigonometry.

(225) T. McB., Philadelphia, Pa., asks: What is the greatest speed ever made by a steam yacht? Is there a record kept of the speed made by these yachts? *A.*—We believe that the greatest speed made by any steam yacht is about 32 miles an hour. No doubt owners of the yachts keep a record, but we have not seen any of them published.

(226) X. Y., Ticonderoga, N. Y., writes: I have got a glass tube ¾ inch in diameter and 34 inches long. I want to fill the glass tube with rubber for a heat regulator. How much will this rubber expand for every degree of heat above 100 degrees Fahr., and what kind of rubber should I use? *A.*—We have not seen rubber used, neither do we deem it suitable for the purpose you mention. But if you insist on using it, we see no other way of obtaining the information you seek than by experiment.

(227) K. Y., Louisville, Ky., asks: Is green or dry hickory bark used in boilers for the purpose of removing scale? and if so, has it come into use recently? *A.*—Various kinds of bark have been used for the prevention of scale for some years past. In recent years kerosene oil has been very extensively used for the same purpose. 2. Is zinc, rolled up into a ball and suspended by a wire into the water, but clear of everything else, a good and safe preventive of scale in boilers? *A.*—It has been tried with different results; some engineers seem to favor it, others do not believe in its usefulness.

(228) G. F., Carlstadt, N. J., writes: I intend to use water from an elevated tank for sprinkling; I need a pressure to throw a stream of 10 feet distant through a nozzle with a ½-inch opening. The water is led from the tank through a ¾ inch pipe 300 feet long. How high must the water tank be located to obtain the required pressure? *A.*—The height of the tank will depend on the smoothness of the pipe, the shape and position of the nozzle. It seems to us that, even under favorable circumstances, the friction in the ¾-inch pipe will require the tank to be placed at a greater height than is practicable, not less than 110 feet. 2. Is there a governor to regulate the speed of windmills in the market? *A.*—Yes.

(229) C. L., ———, asks: Will you kindly state the difference in power caused by the following changes: [Here follows statement of two arrangements of gear wheels and pulleys by which we understand that power is to be transmitted from a line shaft to some machine; we do not print it, because it is not essential, and a complete understanding of the arrangements is not possible from it, and the main point is that in one arrangement the pulley on the main shaft is 72 inches diameter, while in the other it is 90 inches.] He wishes to know which arrangement will give the most power. *A.*—Pulleys of given width, or on which belts of given width are run, will give power in proportion to their diameters, if run at the same speed, and the arrangement with 90 inch pulley will give more than with 72-inch pulley, in the proportion of 90 to 72. 2. Is there any hard and fast rule for such cases as this? *A.*—The rule given, so far as it applies to the proportionate power by different pulleys, is absolute for most working conditions, but there is no hard and fast rule for arrangements of the kind you speak of for transmitting power. It is largely a matter of judgment, guided by experience. As to books there are a number of good ones that will give information on these points. We cannot undertake to name them all, but you will find them in the catalogues of the various scientific book publishers.

(230) G. F. M., Haverhill, Mass., asks: How would you go to work to find the area of the ports of a steam engine cylinder? *A.*—See answer to Question 57, in our issue of January 29, current volume. 2. What should be the size of the steam cylinder for a water cylinder whose diameter is 10 inches; stroke of piston, 18 inches? *A.*—Assuming that the stroke of pistons in the two cylinders are equal, the diameter of the steam cylinder will depend on the steam pressure and on the duty of the pump, neither of which you have given. The diameter of the steam cylinder may be found by the following rule: Multiply the square of the diameter of the water cylinder by the water pressure, and divide the product by the steam pressure; the square root of this product will be the diameter of the steam cylinder. To illustrate: The water cylinder is 10 inches diameter, the required water pressure is 200 pounds, steam pressure 50 pounds; find the diameter of the steam cylinder. According to the foregoing rule we have:

$$\sqrt{\frac{10 \times 10 \times 200}{50}} = 20 \text{ inches}$$

for the diameter of the steam cylinder. Here we have made no allowance for friction. To allow for friction we may have to add 50 per cent. to the required water pressure, so that, in the example, the diameter of the steam cylinder will have to be:

$$\sqrt{\frac{10 \times 10 \times (200 + 100)}{50}} = 24.49,$$

or very nearly 24½ inches.

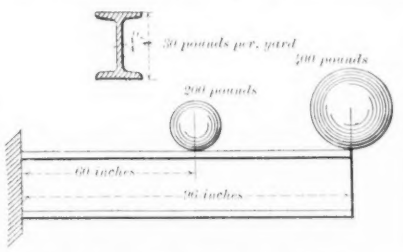
(231) H. R. C., Cleveland, Ohio, asks: How do you change the stroke of an engine, and is there any rule for changing from ⅝ to ¼ stroke? *A.*—You either got muddled up in writing the letter, or you have had no experience in the running of engines. The stroke of an engine cannot be changed without changing the length of crank and cylinder, which practically means that a considerable part of the engine will have to be rebuilt. But probably you mean to ask how to change the point of cut-off in an engine from ⅝ to ¼ of the stroke. If it is a common slide valve engine you will have to increase the lap of the valve, and this increase will depend on the width of the steam port, or the travel of the valve. Good judgment must be used in changing a common slide valve engine to cut off at ¼ stroke, as it is not always advisable to cut off so early in this class of engines. 2. In setting the valve of an engine, how do you determine the amount of lead? *A.*—The general practice is to give $\frac{1}{32}$ of an inch lead in horizontal engines with cylinders, say, up to 18 inches in diameter. The smooth running of the engine depends to some extent on the lead, hence many builders take indicator cards, so as to determine whether the correct amount of lead has been given. 3. Suppose you have no steam gauge on the boiler, and want to set the safety valve so as to blow off at 60 pounds, how do you find the weight of the ball to be placed on the lever, when all the other data is known? *A.*—We should advise you to get a steam gauge, as it is not safe to run a boiler without one. For finding the weight of the ball on the safety valve lever, see answer to Question 392, in our issue of October 2, 1890.

(232) H. W., Catlettsburg, Ky., writes: Kindly send us rule for calculating the stress in boiler stay bolts from ⅝ to ¾ inches in diameter, such a rule as is required by the U. S. Inspector in examining engineers for license. *A.*—In the general rules and regulations prescribed by the Board of Supervising Inspectors of Steam Vessels, we find: "No braces or stays hereafter employed in the construction of boilers shall be allowed a greater strain than six thousand (6,000) pounds per square inch of section, and no screw stay bolt shall be allowed to be used in the construction of marine boilers in which salt water is used to generate steam. But such screw stay bolts may be used in staying the fire-boxes and furnaces of such boilers, and not elsewhere, when fresh water is used for generating steam in said boilers." Consequently, if the stays are placed 4½ inches from center to center, and the surface to be stayed is flat, each stay will have to support a surface 4½ inches square, which contains $4.5 \times 4.5 = 20.25$ square inches. If now the steam pressure is 150 pounds per square inch, then the total stress on the stay will be $20.25 \times 150 = 3,037.5$ pounds, and since the stress per square inch of cross-sectional area is not to be greater than 6,000 pounds, it will be evident that the cross-sectional area must not be less than $\frac{3,037.5}{6,000} = .506$ of a square inch, and its corresponding diameter will be $\frac{13}{16}$ of an inch, nearly. If in place of plain stays, screw stay bolts are used, then we proceed in the same manner as described, but it must be remembered that the area of .506 of a square inch, as found, is the area of the cross-section through the bottom of the threads, consequently to $\frac{13}{16}$ inch we must add twice the depth of the thread; the sum will be the outer diameter of the stay bolt. If, on the other hand, we wish to find the stress to which a given stay is subjected, we proceed as follows: Suppose that the stays are placed 4½ inches from center to center supporting a flat surface which is subjected to a pressure of 150 pounds per square inch; the diameter of the stay bolts is ⅝ of an inch, it is required to find the stress per square inch. Here, again, each of the stays supports a surface of $4.5 \times 4.5 = 20.25$ square inches, and the total stress to which it is subjected is, as before, $20.25 \times 150 = 3,037.5$ pounds. Now the cross sectional area of a bolt ⅝ inch diameter is .306, consequently, the stress is equivalent to $\frac{3,037.5}{.306} = 9,926.4$ pounds per square inch, which, according to the inspector's rule is too great, and will not be allowed.

(233) B. T. A., Philadelphia, Pa., writes: I have a beam fixed at one end and loaded, as shown. It is made of wrought-iron. Its cross-section and dimensions are given in the sketch. Kindly inform me what is the greatest fiber strain in the beam, and also the deflection of the free end. Please explain principles and calculation, if it does not encroach upon your space. *A.*—The greatest stresses will be on the fibers most remote from the neutral surface. For computing these stresses, we must first find the bending moments of all the external forces, thus: The 200 pound weight acts with a leverage of 60 inches, hence its bending moment is $200 \times 60 = 12,000$ inch-pounds; the 400-pound weight acts with a leverage of 96 inches, and therefore its bending moment is $400 \times 96 = 38,400$ inch-pounds. The weight of the beam is 80 pounds, which for the purpose of computation is considered to be concentrated at the center of the beam, hence the bending moment due to the weight of the beam is $80 \times 48 = 3,840$ inch-pounds. Now the bending moment of all the forces will be equal to the sum of the moments just found, thus: $12,000 + 38,400 + 3,840 = 54,240$ inch-pounds. Let us designate this moment of all the forces by M. For computing the stresses on the outer fibers we employ the following formula:

$$S = \frac{M \times c}{I}, \qquad (1)$$

in which S denotes the stress per square inch on the fibers most remote from the neutral surface; c denotes the distance in inches from the neutral surface to the most remote



fibers, and since the neutral surface in this case is in the center of the beam, the value of c will be 2 inches; M denotes the moment of all the external forces as previously found, and I denotes the moment of inertia of the cross-section of the beam with reference to a horizontal axis passing through the center of gravity of that cross-section. To compute the moment of inertia I of the cross-section requires considerable labor; but all this labor may be avoided by referring to a pocket-book published by manufacturers of rolled beams. For instance, referring to the pocket-book published by the New Jersey Steel and Iron Co., of Trenton (Cooper, Hewitt & Co.,) we find that the moment of inertia I for a beam of the cross section, and weight per yard as here given is 7.5. Now, substituting for the symbols in formula (1) their values, we have

$$S = \frac{54,240 \times 2}{7.5} = 14,464$$

pounds per square inch. This is the tensile unit stress on the upper fiber, and also the compressive unit stress on the lower fiber. The New Jersey Steel and Iron Company allow a maximum stress of 12,000 pounds only; according to this standard the beam is not strong enough for the load. The deflection you may also obtain approximately by referring to pocket-book mentioned. Space will not allow us to give a rule for its computation, which is somewhat complicated. The deflection will be about ¾ of an inch.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

George B. Grant—Gear Wheels. See p. 20.

Link-Belting and Sprocket Wheels.
Send for Catalogue of Link-Belting.
Over 50,000,000 feet of Link-Belt in use.
Link-Belt Engineering Co., Philadelphia and N. Y.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

N. Y. City Bolt & Nut Co., Limited.
See Sterling Elliott's ad. on page 12.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

"The Bulldozer," a new departure; forging by pressure. M'f'd by Williams, White & Co., Moline, Ill.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Ice and Refrigerating Machines. 155 sold, and all successful. David Boyle, 521 Monroe St., Chicago, Ill.

Get particulars of our new Wall, Suspended and Radial Drills. C. H. Baush & Sons, Holyoke, Mass.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

Wrist-Pin Machines. Pedrick & Ayer, Philadelphia, Pa.

Horizontal and Radial Drilling Machine. Pedrick & Ayer, Philadelphia, Pa.

Light Special Machinery and Tools to order. The Meriden Machine Tool Co., Meriden, Conn.

$13.00 I. Dea L. Drawing Stands. The original. Send for postal. W. S. Rogers, Troy, N. Y.

Headquarters for Star Hack Saws, Miller's Falls Co., 93 Reade Street, New York.

S. A. Smith, 23 So. Canal St., Chicago, Ill., agent for Appleton Mfg. Co.'s Emery Grinding Machinery.

Audubon Machine Works, New Haven, Conn. Electrical work, superior facilities. Builders of machinery, heavy and light.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

For the latest improved Eccentric Hook, Connecting Rods and Stub Ends, address T. C. Dill Machine Company, Philadelphia, Pa.

S. W. Card & Co., Mansfield, Mass., make everything in the line of Taps and Dies. S. A. Smith, 23 S. Canal St., Chicago, Western Agent.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, Ill.

Self-adjusting Hand-Screw for pattern makers, cabinet makers and wood workers generally. Send for circular. Wm. H. Denney, Lancaster, Pa.

"Twenty Years With the Indicator," by Thomas Pray, Jr. 10,100 sold. Price, $2.50. Order of bookseller; take no other.

"Hawkins' Hand Book of Calculations for Engineers, Firemen and Machinists." $2.50 postpaid. Theo. Audel & Co., 91 Liberty St., N. Y. Catalogue.

N. Y. City Bolt & Nut Co., Limited, 33 and 35 Desbrosses St., N. Y. City, manufacturers of Machine Bolts of every description. Write for estimates.

25″ / 32″ / 37″ / 42″ — "Only Drill Press built on 'Ko-rekt' principles, even if they come from Jersey." Gould & Eberhardt, New Ark, N. J.

DuBois & DuBois, Patent Attys., 715 11th St., Washington, D. C., procure first-class patents. Send stamp for illustrated pamphlet, "March of Invention," containing valuable information, and list of references.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases,
31 Nassau street, New York.
Send for Brief History of Patent Legislation.

Foot and Power Presses for Metal, Paper and Leather. Perforating Dies a specialty. Estimates given for special machines or dies. Edwin B. Stimpson & Son, Manufacturers, 31 Spruce St., New York.

Books for Machinists and Engineers. Send for our large Book Catalogue. Just published. It contains works on every practical subject. Norman W. Henley & Co., 150 Nassau Street, N. Y.

Every draftsman needs one. The Engineer's Sketch Book of mechanical movements, appliances, devices, contrivances, etc., by T. W. Barber. 1,936 illustrations, 8vo., cloth, $3. Catalogue of books on mech. subjects free. E. & F. N. Spon, 12 Cortlandt St., New York.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

Club Rates.—If no one is getting up a club for the AMERICAN MACHINIST in your town or establishment, send for Circular of New Club Rates, and try it yourself. Address AMERICAN MACHINIST, 96 Fulton St., New York.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Publishing Co., 96 Fulton St., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2, postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

MANUFACTURES.

The manufacture of steel rails is to be established at Jefferson, Tex., on a very large scale.

The Smith Paper Company, of Lee, Mass., contemplates adding machinery to its plant.

At New Lewisville, Ark., efforts are being made for the establishment of an iron foundry.

The Whittier Machine Company, of Boston, are to have a new shop erected, to be 116x75 feet.

The Dalton Development Company will erect a foundry and car wheel works at Dalton, Ga.

J. B. Barrett & Co., will probably erect an iron foundry and machine shop at Wytheville, Va.

Work is progressing on the stone foundation for the Buena Vista (Va.) Steel Company's Works.

The Davis and Furber Machine Company's foundry at North Andover, Mass., is being enlarged.

W. B. Pallett, of Cincinnati, O., is reported as to establish a wire fence factory in Tuscaloosa, Ala.

The Eagle & Phœnix Manufacturing Co., Columbus, Ga., will put new machinery in its cotton-mill.

W. H. Baldwin, Jr., & Co., are enlarging their cotton-mill, at Savage, Md., by an addition 80x36 feet.

A new shop, 115x116 feet, two stories, is to be erected by the Whitin Machine Company, Whitinsville, Mass.

The Industrial Iron Works at Bay City, Mich., are preparing to build an addition 255x90 feet to their works.

A factory to manufacture coffee-mills and other light hardware specialties is now being erected at Madison, Ill.

Articles of incorporation have been applied for by the Montreal (P. Q.) Metal Company, capitalized at $50,000.

The J. M. Worth Manufacturing Company, Worthville, N. C., is reported as to put new machinery in its cotton-mill.

The Whittier Machine Company, of Boston, Mass., are preparing to erect a new shop which will be 166x74 feet.

The J. M. Worth Manufacturing Company, Central Falls, N. C., is reported as to put new machinery in its cotton-mill.

The Union Iron Works Company, Selma, Ala., has, it is reported, reorganized recently, with a capital stock of $40,000.

It is stated that a stock company will be organized at Mt. Holly, N. C., for the purpose of erecting another cotton-mill.

The Western & Atlantic Railroad Company is reported as to convert its railway station at Ringgold, Ga., into machine shops.

William Yelland will erect a machine shop in Philadelphia, 24x40 feet, on the east side of Tacony street, north of Orthodox street.

The Charlestown Mining, Manufacturing and Improvement Company has secured boiler works for establishment at Charlestown, W. Va.

Fayelville, Tenn., has a new industry in the shape of a machine manufacturing company, of which Bell, Donthal & Co. are the proprietors.

The Peninsular Stove Company, at Detroit, are erecting a large two-story brick building as an addition to their already extensive plant.

Nixon & West are erecting works at Chattanooga, Tenn., for the manufacture of brass and iron shelf hardware, including casting and finishing.

The Hallowes Car Axle Box Company, of Jersey City, N. J., has been incorporated to manufacture car axle boxes. The capital stock is $100,000.

The Tubular Car Company will establish an immense plant near Bradford, Pa. It will cover 6,000 acres of ground, and employ about 5,000 men.

The Scott Machine and Hardware Company, at Denver, Colo., are enlarging premises to double former size, and will put in several new tools.

The plant of the Donaldson Iron Company at Emaus, Pa., is to be improved so as to increase its facilities for making cast-iron pipe and castings.

John Ferrin, of West Virginia, is reported as having signed contract for the erection in Salem, Va., of a plant for the manufacture of steam boilers.

The Texarkana Car and Foundry Company, Texarkana, Texas, will rebuild on a larger scale its car and machine shops recently reported as burned.

The Rock Island Railway Company is reported to have bought the Peoria (Ill.) rolling-mill property, and, it is said, will remove their shops to that place.

The Case Engine Company, of New Britain, Conn., are building an addition 35x50 feet to their shops, which will soon be equipped and ready for occupancy.

The Sergeant Manufacturing Company, Greensboro, N. C., is reported as enlarging its machine shops by the erection of an additional building 50x75 feet.

A new manufactory of roller process machinery is to be started in Mounds, W. Va. This company has an order to put in machinery for ten mills in this State.

The Falcon Iron and Nail Company, of Niles, O., are putting up a new building, 150x175 feet, in which they propose to manufacture galvanized sheet-iron.

The Chesapeake & Ohio Railway Co. (office, Richmond,) has purchased over $50,000 worth of new machinery for use in its Clifton Forge (Va.) machine shops.

The Norwood Car Replacer Company will, it is stated, erect malleable iron works at a cost of $100,000 in Ellicott City, Md., provided the citizens subscribe $25,000.

A $100,000 stock company is being organized to erect a bolt and nut factory at Curtis Bay (P. O. Baltimore) Md. The South Baltimore Car Works can give information.

The Smith-Courtney Company have been incorporated at Richmond, Va., to have a capital stock of not less than $75,000, nor more than $250,000, to manufacture machinery.

It is reported that a factory is to be erected at Frederick, Md., by Walling, Tyson and Zimmerman, for the purpose of manufacturing the Zimmer window shutter fastener.

It is reported that five men who have been connected with the Canton (Ohio) Bridge Company, will put down a plant for building iron and steel bridges at Springfield, Ohio.

At Orlando, Fla., the South Florida Foundry and Machine Works will soon put in an outfit for the manufacture of tubular boilers, and is now in the market for suitable machinery.

W. F. Collard, W. E. Sullivan and J. E. Brennan have incorporated the New Era Safe Company at Newport, Ky., to manufacture safes, locks, vaults, etc. The capital stock is $100,000.

The Youngstown Car Manufacturing Company, of Youngstown, Ohio, have a large number of contracts on hand that will necessitate a small increase in their present force of employes.

Buchanan, Va., is reported to have closed a contract with the Smith and Briggs Brass Company, of Brooklyn, N. Y., whereby the company will remove their works to the southern city.

The Kincaid Manufacturing Co. has adopted a recommendation to issue $20,000 of preferred bonds for the purpose of putting 2,500 additional spindles in its cotton-mill at Griffin, Ga.

The Riverside Iron Works at Wheeling, W. Va., is making preparations for the building of an addition to the tube works of its plant. The new mill will be nearly as large as the original plant.

A. A. Springer & Son, of St. Augustine, have made a proposition for the removal of their ice factory to Fernandina, Fla. They operate as the St. Augustine Ice Manufacturing Company.

T. C. Botsford and J. N. Hurt have selected three acres of ground in Akron, O., on which to build their proposed steam car heating works. The buildings will be 80x300 feet, and another 60x200 feet.

The Ellis and Lessig Steel and Iron Company, Limited, of Pottstown, Pa., have decided to rebuild their plant at that place, and not to remove to Salem, Va., as previously announced by them

Parties in Rome, Ga., are discussing the advisability of erecting a furnace at that point for the manufacture of ferro-manganese from the ores that exist in considerable quantities at Cedartown, near Rome.

The Wallace and Graves Machine and Foundry Company have filed articles of incorporation at Lafayette, Ind. The capital stock of the company is $20,000, and they will manufacture steam boilers and castings.

The work of removing the machinery of the Underhill Edge Tool Company from Nashua, N. H., to East Douglas, Mass., commenced this week and quite a number of workmen will foilow the removal of the plant.

The Springfield Boiler and Manufacturing Company, of Springfield, Ill., will greatly enlarge their works at that place, and will put in a number of improved boiler makers' tools, such as riveting machines, etc.

J. W. Hughes and W. E. Callahan are reported as having purchased and as to operate the Ford property, Lynchburg, Va., consisting of wagon works, iron foundry, machine shops and agricultural implement works.

Landis Brothers, of Waynesboro, Pa., have issued a catalogue devoted to a description and illustration of their universal grinding machines. Those who wish to be posted in grinding machinery should have a copy.

R. M. Chambers, of Baltimore, Md., has received contract to erect factory building for the New York Sewing Machine and Manufacturing Company at East Richmond, Va.; work on same will commence at once.

E. W. Mealey, C. F. Manning, W. L. Hammond and E. B. Knight, of Philadelphia, Pa., have incorporated the Hagerstown (Md.) Heat and Light Company, to manufacture gas and operate electric light plant. The capital stock is $35,000.

The Otis Co., Ware, Mass., is about to erect a new cotton-mill. The boiler-house, chimney and entire steam-making plant will be designed by the Hartford Steam Boiler Inspection and Insurance Company, and will be a model affair.

A movement is on foot at Nashua, N. H., to establish a co-operative edge tool factory by certain employes of the American Edge Tool Company, who are to remove to Douglas, Mass. It is proposed to raise a capital of $25,000.

The John F. Byers Machine Company, of Ravenna, O., have just completed the erection of their machine shop, the dimensions of which are 28x120 feet. They also intend to put up a large foundry building during the summer.

H. D. Emerson, T. J. Creaghead, C. L. McCrea and others have incorporated, at Covington, Ky., the Creaghead Engineering Company, to manufacture all kinds of electric, mechanical and manufacturing appliances. The capital stock is $25,000.

B. D. Gibson, William Campbell, G. D. Moore and others have incorporated the Charlestown (W. Va.) Manufacturing and Development Company to manufacture iron, aid in locating factories, etc. The capital stock is to be not more than $500,000.

The Mayo Bridge and Land Company has been incorporated at Richmond, Va., to purchase Mayo's bridge, build factories, develop water-power, etc. The capital stock is to be not more than $300,000. W. B. Gay is president, and E. H. Gay, secretary.

P. H. and F. M. Roots Company, of Connersville, Ind., have issued a new catalogue of their famous "Root" blower. It is profusely illustrated, and contains much information that is of value to any one having to do with manufacturing operations.

The Cable Iron Car Roofing Company, of East St. Louis, has been incorporated, with capital stock of $300,000, for the manufacture of car roofing, doors, and other railway appliances; incorporators, Reed Northrup, John C. Wands and G. A. Bannantine.

There is water-works agitation in Rawlins, Wyo.; Amsterdam, N. Y.; Sidney, Wash.; Springfield, Ohio; Kansas City, Mo.; Columbus, Miss.; Fladreau, S. D.; Providence, R. I.; Stanberry, Mo.; Maple Shade, N. J.; Metropolis, Ill.; Lincolnton, N. C.

It is reported that the Denver Steel Company has decided to locate at Manchester, Colo., and the Denver & Rio Grande and the Fort Worth roads have surveying parties in the field with the view of running branches from their main lines to that point.

The Harrisburg Boiler and Manufacturing Company, of Harrisburg, Pa., have issued some new and attractive printed matter, showing by illustrations and otherwise the peculiar merits of their "Star" water-tube boiler, and "Star" gas burner boiler.

Swift's Iron and Steel Works, located at Newport, Ky., and lately purchased by the Cincinnati Corrugated Iron and Steel Company, will commence operations some time in May. It is said that Mr. L. F. Hubbard, of Covington, will be the superintendent.

J. C. O'Gorman and Michael O'Donnell, of Stillwater, Minn.; P. Gilbert, G. C. Hill, Jr., and others, have incorporated the Potomac Electric Co., at Washington, Md., to produce electricity for use as a motive power or illuminant. The capital stock is $25,000.

Pratt & Cady, of Hartford, Conn., have erected a new brick foundry 75x240 feet, with monitor roof, and having a capacity of over 40 tons per day. It is wholly of iron, and a pattern-room, casting-room and storage sheds have also been built, of nearly equal size.

Cincinnati Shop Notes—Continued.

(Editorial Correspondence.)

At the shops of J. A. Fay & Co. I found about 340 men employed, the demand for wood-working machinery (from this shop at least) seeming to be as active as ever.

NO FOUNDRIES.

In speaking of the number of men employed in Cincinnati shops it should be mentioned, perhaps, that in nearly every instance this represents more men actually employed upon the work than the figures seem to show, owing to the fact that it is almost the universal custom here to buy castings instead of making them on the premises, as is usually done elsewhere. I was unable to discover any special reason for this, except, perhaps, that the part of the city in which the shops are located is considerably crowded, and it is, therefore, probable that the matter of ground rents has more to do with it than anything else. The only prominent shop in Cincinnati, the name of which now occurs to me, where a foundry is included in the plant, is that of the Lane & Bodley Company.

BABBITTING.

In wood-working machinery there is always much babbitting to do, and we therefore find on every floor of the Fay shops, and in several places on some floors, gas babbitt melting furnaces, which for this purpose occupy the minimum room, and conduce very much to neatness and economy in the use of babbitt. They also use a system of babbitting jigs, which are essentially frames which can be clamped in place on the frame of a machine, often located by means of dowel pins inserted in holes which have been previously drilled, and having Vs planed in them which support babbitting arbors. These Vs being properly located with reference to each other and to the various parts of the machine, perform the same function for a babbitted box that the ordinary bushed jig does for a box that is bored from the solid metal, and have all its advantages.

DRILLING JIGS.

The drilling jigs are mostly rather in the nature of templates which bolt onto the frames or other parts of the machine, which must then be leveled up under the drill press, radial drills being used for the heavier work. As the jigs must necessarily be large, and the number of machines made by the use of any one set of them quite limited, as compared with such work as sewing machines or small arms, while the accuracy required is not nearly so great, they must of course be more cheaply constructed. Very little finish is therefore put on them, but the holes are laid out with varying degrees of accuracy, according to the particular part of the machine the jig or template is to be used for, drilled and reamed with a taper reamer, after which bushings that are made in large quantities and kept in stock are driven in. These bushings are plain, without flanges—simply thimbles with a hole through them and turned tapering outside. The tool maker accustomed to the finest work in the way of jigs would be apt, perhaps, to turn up his nose at these, especially if he were a little thoughtless, and therefore failed to note that the conditions not only do not call for the finest jigs, but do not allow of their construction, while those in use are probably as good as the conditions do admit of, and answer the purpose very well, being at least infinitely better than none at all. An instance of their usefulness was shown me in the case of a planer for planing heavy timbers up to 50 feet in length. These machines are built here in two ways, *i. e.*, they are made complete so far as the metal parts are concerned, and these are then mounted by the purchaser upon timbers to form the bed. The machine shown me, however, had a solid iron bed, which, on account of its great length, had to be cast and planed up in sections. These were drilled by jigs, and not put together at all until they reached the upper floor where the machine was erected.

A complete system of hand trolleys has been introduced here, by which work is moved about with great facility.

THE TOOL-ROOM.

In the tool-room is to be seen one of the oldest sets of cylindrical gauges made in this country. They were made about '66, by John Richards, who, at that time, was connected with the concern. Beside this old set they also have one of the newest sets of plug and ring gauges made by the Pratt & Whitney Co., there being all sizes by 16ths from $\frac{1}{2}''$ to $3''$. A B. & S. universal milling machine is to be seen here which has attained the venerable age of 20 years. It still does good work, and stands alongside of another by the same makers which is much newer, though not strikingly different in appearance.

RED OIL CANS.

The supply of oil is kept in the tool-room, and when a man's oil can is empty he simply takes it to the tool-room and gets one that is full in place of it. Two different kinds of oil are used—a mineral oil for lubricating, and lard oil. The ordinary malleable iron oilers are used, but those which contain the mineral oil are painted a bright red, while the others are unadorned. Thus the necessity for making the usual test to determine which kind of oil a given can contains is avoided; this test, as every shop man knows, usually consisting in squirting some of it out upon the floor, and observing its color as it flies.

CABINET FOR MILLING CUTTERS.

A great many cutters are on hand for use in the milling machines, and for keeping them within a small space and convenient for use when wanted, the idea presented to our readers by Mr. Chas. S. Beach, issue of October 24, 1889, has been made use of. Each pivoted board is labeled on the edge, showing the character of the cutters on it. Every cutter is thus readily accessible, protected from accidental injury or loss, while the cabinet is neat and in every way satisfactory.

AUTOMATIC SCREW MACHINES.

Large numbers of bolts and screws are used here, in fact, about 300,000 of them annually, and for their production they have recently put in four automatic screw machines made by the Pratt & Whitney Co., besides which there are, of course, other turret head machines of the ordinary type. Automatic screw machines are not often met with in shops which are not engaged in the manufacture of screws for the market, but there are indications that they are to be used much more generally as the magnitude of our shops increases.

THE TRIUMPH COMPOUND ENGINE CO.

Near the Fay shops are those of the Triumph Compound Engine Co., in which an engine of entirely new design is being made, which is the invention of Mr. J. H. Eickershoff. In general appearance it resembles the Westinghouse somewhat, but has three vertical cylinders placed side by side, and there are no valves as such, the pistons being made to uncover ports in such a way as to effect the distribution of steam. All three cylinders—with the various passages for

steam from one to another—are cast in a single piece, and the cylinders are bored out simultaneously by a horizontal boring machine in which there are three boring bars parallel with each other, and all driven from the same train of gearing. It was built by the Universal Radial Drill Co., and is a very efficient machine, though they are now talking of having one built which will be vertical instead of horizontal, the idea being that it will be more convenient, and the chips will be more readily disposed of during the boring process.

The pistons of this engine are proportion ately very long, and in some of them, at least, there are steam ports and passages, making quite a complicated casting. It was found that where these pistons were turned up to fit the cylinder, and then put to use, the heat of the steam caused them to spring more or less, and bind in the cylinder. This difficulty has been overcome by first turning the pistons to near their finished diameter, and then annealing them by heating nearly or quite red hot. Upon being then finished in the lathe no trouble is experienced with them from subsequent springing. All the tools of this shop are new, many of them being specially constructed, and it is evident that the object is to do good work in the most economical manner. The shop is, of course, not large as yet, and is an old one yet well arranged and provided with a very complete system of overhead traveling cranes worked by hand, there being six of these which completely cover the machine shop floor. One of the most novel things about this engine, perhaps, is the connecting rod. There are, of course, three of these in each engine—one for each cylinder, and as the engine is single-acting the stress upon these rods is always a compressive one. There are brasses of about the usual form at each end of the rod, but the strap which holds the upper brasses in place runs along down each side of the rod, and by two bolts is united firmly to the other strap. A wedge is then introduced between the end of the rod and the main brasses, which, when tightened up by means of a nut provided for that purpose, and which is near the lower end of the rod, where it is accessible, takes up the lost motion in both brasses.

CINCINNATI MILLING MACHINE CO.

The shops of this company are on the two lower and the top floors of a building, the third floor being occupied by the plant of the Cincinnati Screw and Tap Co., which thus divides the establishment into two parts by what might be called a horizontal section. This results from the fact that the business of both concerns was formerly all under one ownership and management, which is not now the case.

The shop is very much crowded, so much so that it is seen that new quarters will soon have to be provided, and there has been already some investigation of the matter of sites for a new shop which will be somewhere in or near Cincinnati.

What the concern lacks in shop room and conveniences is, so far as possible, made up by the use of special fixtures in doing the machine work on their milling machines and cutter grinders. They are unusually well provided with such fixtures, there being, so far as I was able to see, scarcely a single operation which is performed without the aid of some special appliance intended to secure either greater accuracy or economy of time, or both.

PLANER WORK.

For planing the knee, for instance, after the part which fits the base or column of the machine has been planed, it is put onto an angle plate which is fitted to the planer, and which has been carefully scraped up exactly square, and its upper edge made the shape to which the remaining portion of the knee is to be planed.

This portion of the plate is of hardened steel, and as the tools are set to it and pass over it in planing the knee, it is comparatively easy to secure uniformity, not only in the form of the angular bearing surfaces, but also in the relation which the planed surfaces at one side of the knee bear to those on the other side. This is a type of the fixtures which are made use of all the way through the planer work, very little of it being done by the older methods.

BORING FIXTURES.

Another instance of the use of special devices was noticed in the operation of boring the holes in the frame of the machine for the spindle boxes, and for the overhanging arm. This fixture fastens to the top of the knee, which has been previously put in place and ascertained to be square. A support is then attached at the back of the machine, which holds the extreme end of the bar, and this is set in position by tramming. As the boxes are tapering outside, the holes for them must be bored on a taper, and the cutters are therefore fed along the bar in taper seats provided for them, both holes being bored at the same time. Most of the boring on the smaller parts of the machines is done under drill presses, the fixtures in most cases being so arranged that the boring bar bears a fixed relation to the work, regardless of whether the drill spindle is exactly square with the base or not, a universal joint being introduced into the boring bar for that purpose, which, of course, would allow the bar to be a good deal out of line with the drill spindle without affecting the accuracy of the work in the least, since the drill press merely performs the function of holding the fixture approximately square with its spindle and giving motion to the bar, which is guided by the steel bushings through which it passes.

INTERCHANGEABLE BEVEL GEARS.

A number of small bevel pinions are used about the feed mechanism of the machine, and great pains are taken with these to have them interchangeable. They are formed by a tool which shapes the face and top at the same time, and are then shaped in a similar manner at the back, and are tested after being cut by being put into a fixture which has holes bored at right angles to each other, in which spindles are inserted on which the gears are placed. Any gear must go on either of these spindles and work correctly. Even the pin holes for securing them to their shafts are drilled in a fixture, which secures uniformity and interchangeability in this respect also.

HOLDING BORING BAR CUTTERS.

For holding cutters in small boring bars, they have adopted a plan here, which, though it is so simple and obvious as to make it probable that it has been used elsewhere, yet I do not remember having encountered it before. The cutters, which are made of flat bar steel in the usual way, are fitted to a square slot which is cut through the bar, and just at the upper edge of this slot a hole is drilled through the bar at right angles to the slot, and so that about half the size of the drill cuts into it. This hole is then reamed taper, and a taper pin fitted. The upper edge of the cutters are then provided with a semi circular notch into which this pin goes and locks them in place, centering them accurately at the same time, so that they may be double ended and made to bore their size very accurately. The cutters may be simply round pins passed through a hole drilled in the bar if desired, and the fastening, in any event, is one which does not project from the bar, is simple and inexpensive, and answers every essential requirement of a cutter fastener.

A TRAVELING CRANE ON THE FLOOR.

This shop offers no opportunity for the employment of the modern traveling crane, but a very ingenious and novel substitute for it has been devised for handling the only heavy piece there is to be handled, which is the column of the machine. This has a wide rectangular flange at the bottom, which extends out a considerable distance all around, and there require to be four holes through this, one at each corner, for bolting it to the floor when it is set up for use. About the first thing done on this casting when it comes into the shop is to drill these holes and then tap them with a square thread. Then there are two timbers about 4 inches square, that, at the proper distance apart, have square screws passing down through them, two in each piece. One of these timbers is placed along each side of the machine over the flange, and is supported at either end on small iron wheels. The screws are entered into the tapped holes in the flange of the base, and turned until the casting or machine is raised clear off the floor, and is supported by the timbers and wheels, which thus form a track, with which it is readily taken wherever wanted, and the whole thing is so cleverly arranged that the work is done easily and quickly, and, in connection with the elevator for taking work from one floor to another, forms a very good means of moving work about, though, of course, it is only applicable where the work is confined, as it is here, to the production of a certain machine to which the truck can be adapted.

UNIVERSAL RADIAL DRILL CO.

At the shops of the Universal Radial Drill Co. I found another place which has been outgrown to some extent, the business having increased within the past few years to such an extent as to make the seeking of new quarters before long a necessity.

The work here tends toward heavy tools, many of them built to order, so that there is little here outside of the regular good machine shop practice, jigs, however, being applied to all parts of the work, the nature of which will admit of their use.

A number of new tools have been added to the plant recently, including a number of turret head machines, a line of which they contemplate soon putting on the market, and which will probably be the subject of illustration in our columns before long. A good many bevel gears are used on the machines, and these are now all planed with a Gleason bevel gear planer. A good deal of very heavy work is being done for the Cincinnati Water-works, the main pumping station being but a short distance from the shop. Among the heavier jobs recently completed was the radial drill for Carnegie, Phipps & Co. (illustrated in our issue of April 30), and a pipe-facing machine built for the Addyston Pipe Works, which is of 60-inch swing, double-headed, and will take in between the heads a length of pipe 17 feet long, which is held stationary as in cylinder boring, while the heads carry swinging arms provided with sliding tool rests fed by star feeds to do the facing.

BRADFORD MILL COMPANY.

In the building of the Bradford Mill Company, Mr. Muller, who started in the business of making lathes on his own account at nineteen years of age, found shop room, and his business gradually increasing, it was carried on for some years under the name of the Muller Machine Tool Company, which confined its efforts entirely to the production of lathes of small and medium size, and of first class quality. The business continued to grow, and as more shop room was required for it, while the work of the Mill Company was not so pushing, usually, it was thought to be advantageous to combine them under the name of the older company, which has been well known for years as a manufacturer of mill furnishing machinery. About thirty lathes are now made here per month, and the shop resembles others in Cincinnati, which have been spoken of, in being devoted exclusively to one thing, upon which every effort is concentrated.

The type of lathe made here will soon be the subject of an illustration in our columns, so that I need say nothing at this time about it, but so far as the shop is concerned, it is remarkably well arranged and equipped for building lathes.

Confining themselves as they do to certain of the smaller and medium sizes of lathes, they are, of course, able, not only to have all the machine tools adapted specially to the work, but they can also make full use of the jig, which they are doing. The machine tools are arranged on one side of the machine shop floor, while the other is devoted entirely to erecting purposes, and has overhead travelers for handling beds and finished machines. The largest planer is a "Gray," 62 inches, to plane 26 feet long, and the platen of this machine is covered with beds for the smaller sizes of lathes—two rows of them being placed side by side, which are operated upon by two heads. To illustrate the care used in getting results from machine tools, I may mention the fact that the foundation upon which this planer stands is of masonry 6 feet deep, and was put in three months before the planer was put upon it, so that it should be thoroughly settled and dried out. This planer, at the time of my visit, had been running for some time, and I think I never saw one in which there was better evidence of the ability to produce plane surfaces. In the slides as they were uncovered by the motion of the platen, there was not the least evidence of any inequality of bearing whatever—no bright spots, scratches or evidence of any kind that the platen rested upon anything else than a perfectly uniform film of oil. This planer is placed at one end of the shop, near the erecting floor, and close to a door, by which trucks that deliver the beds and take away finished machines can enter. Thus the heavier beds get into one corner of the shop only, being delivered directly to the planer, from which they are moved over to the lower end of the erecting floor, where they are completed near the door by which they came in, and finally go out again.

The lot upon which the shop stands is a large one, and gives plenty of opportunity for enlargement of the shop, and it is the intention to make extensive additions before long, the space occupied by the lathe business at present being two floors 200x65 feet.

F. J. M.

Machinists' Supplies and Iron.

NEW YORK, May 16, 1891.

Iron—American Pig—There has been no change in prices since our last report.

We quote: No. 1 Foundry, Standard Northern brands, $17 to $18; No. 2 is selling at $16 to $17, and Gray Forge at $14 to $14.50. Southern brands of good quality are obtainable at $16 to $17.50 for No. 1 Foundry; and $15.75 to $16 for No. 2; and $14 to $14.50 for No. 3.

Scotch Pig—We quote at $24 50 for Coltness; $22 for Dalmellington; and $20.50 for Eglington.

Copper—The market for Lake copper is nominal and unchanged at 13¼c. to 13¾c. Arizona Ingot is quoted at 12¾c. to 13c.; casting copper is wanted at 11¼c., while 11⅜c. is asked.

Lead—The market is said to be well supported, but business has been retarded, it is claimed by the decision relating to the admission of Mexican ores. Spot lead is unchanged at 4.20c. bid, and 4.30c. asked.

Spelter—No improvement is looked for until the strikes have been settled. Western brokers are offering first-class brands at 4.85c. for New York delivery, but there is no disposition to buy.

Tin—The market is higher for all positions, but there is a hesitancy among buyers. Sales have been made at 20 40c. to 20.50c.

Antimony—The market remains steady.

We quote Hallett's at 15¼c. to 15¾c.; Cookson's, 16¼c. to 16¾c.; and 15⅝c. for X. L.

Lard Oil—The market is about steady at 55c. to 55½c., for Prime City, according to holder and quantity.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Wanted—Agents in every shop for fine tools; big inducements. Address E. G. Smith, Columbia, Pa.

Position by asst. mech. draftsman, 3 years' drawing-room and shop exp. T Square, AM. MACH.

Wanted—Situation by a mechanical draftsman, who has had considerable experience in the shop; A1 references. Draftsman, P. O. Box 990, Hartford, Ct.

A comp. mech. eng. and draftsman will be open for engagement about June 1st. Thorough in designing compound engines and general mach. Well up in electricity. Box 87, AMERICAN MACHINIST.

Wanted—First-class pattern makers at once; none but experienced men need apply; steady work and good wages guaranteed. Address George J. Cory, Sparrow's Point, Maryland.

Wanted—First-class moiders at once; steady work and good wages guaranteed; men are wanted for loam, dry sand and green sand work. Apply, or address James Powers, Sparrow's Point, Md.

Wanted—Experienced man to sell boilers in Pittsburgh and vicinity on small salary and liberal commission. Address, with reference, Energy, AMERICAN MACHINIST.

Wanted—A first-class engineer and draftsman to take charge of drafting department. Thoroughly acquainted with laying out steam plants in all their details. Salary liberal. Address Box 92, AMERICAN MACHINIST.

Wanted—By mining company in Mexico, first-class molder; man that is capable of mixing charges and able to run cupola; location very healthy; engagement for four months. Address, giving particulars, reference and terms, Box 89, AM. MACHINIST.

Wanted—At Pittsburgh Locomotive Works, Pittsburgh, Pa., a competent foundryman to take charge of iron and brass foundries; must be active, entirely temperate, and thoroughly understand locomotive work; state salary expected, and give references.

Wanted—A pattern maker, who is acquainted with saw-mill machinery; also, a young man who is acquainted with drafting; must be well educated, and know something of saw-mill machinery; his duties will be part office work as well as drafting. Address Box 91, AMERICAN MACHINIST.

Wanted—Position as supt. or foreman, by a young man, 36, successful in the systematic manufacture of machinery and mechanical devices, and in the economical management of men; a designer and draftsman of automatic and interchangeable machinery, tools, jigs, etc. W. H. S., Box 197, Burnside, Conn.

Wanted—A good tool maker and general machinist—one capable of designing and making tools for screw machines, for the cheap manufacture of set, cap and special screws, etc. Apply, giving references as to ability, character, etc., and stating salary, to Box 88, American Machinist.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Cheap 2d hd-lathes & planers. S. M. York. Clev'd, O.

All sizes punch presses & dies. R. T. Lane, Clev'd, O.

Special wire mach'ry. Amer. Tool Wks., Clev'd, O.

Just out: aluminum steel hack-saws, hard but not brittle. Crescent Mfg. Co., Cleveland, Ohio.

New catalogue of engineers' specialties free. Crescent Mfg. Co., Cleveland, Ohio.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Wanted—Customers for our new Radial Drills. C. H. Baush & Sons, Holyoke, Mass.

Wanted—Specialties to build for the Southern trade. Bluefield Iron Works, Bluefield, W. Va.

Wanted—Engineers to write for catalogue of all the latest and most valuable mechanical, scientific and electrical books which are given free with each barrel of the Pittsburgh Boiler Scale Resolvent. Pittsburgh Boiler Scale Resolvent Co., Pittsb'gh, Pa.

"TIME IS MONEY."

"The smith his iron measures
Hammered to the anvil's chime."—Longfellow.

"And his **BRADLEY HAMMER** treasures,
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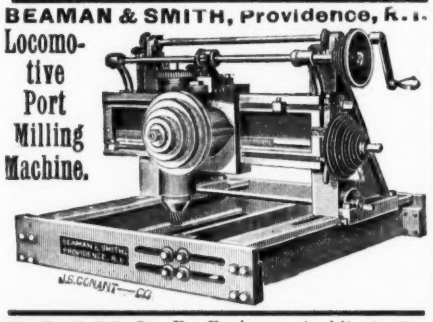

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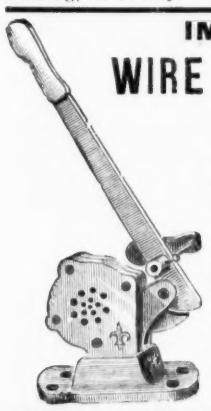

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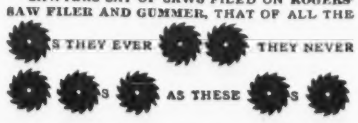

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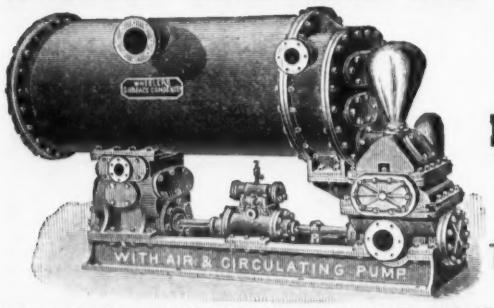

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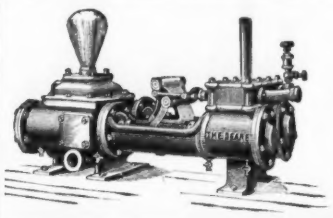

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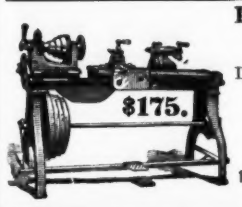

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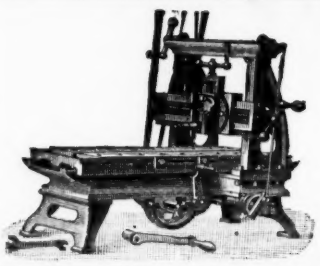

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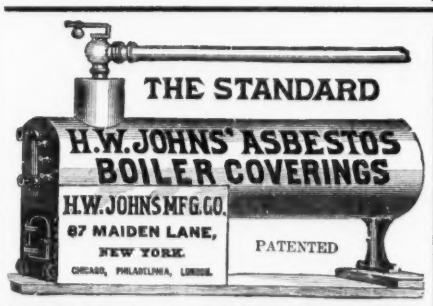

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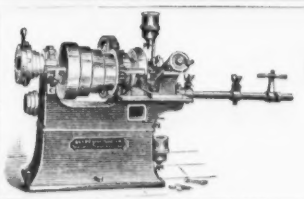

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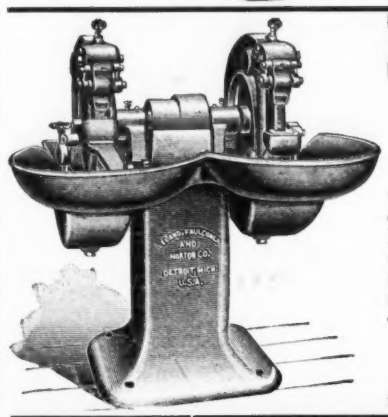

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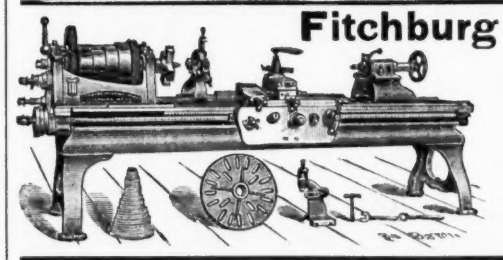

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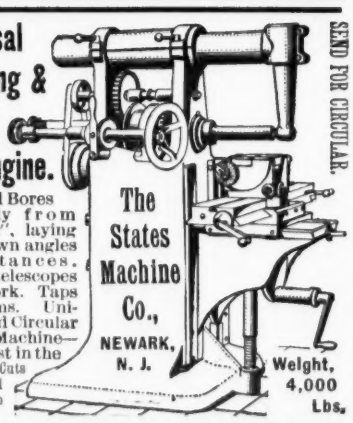

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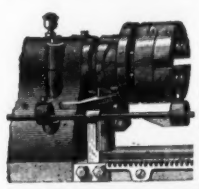

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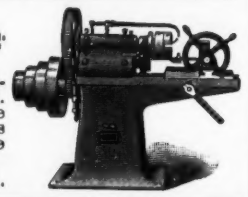

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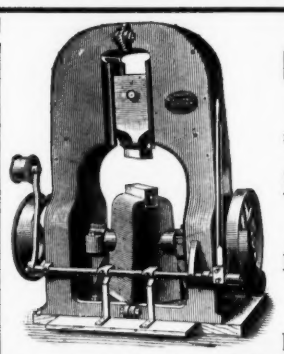

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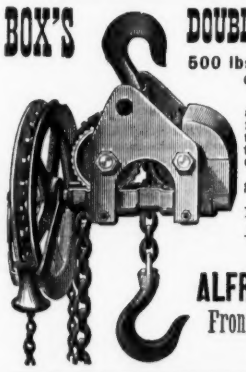

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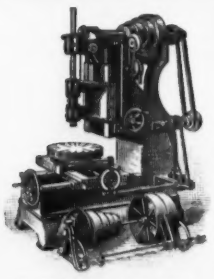

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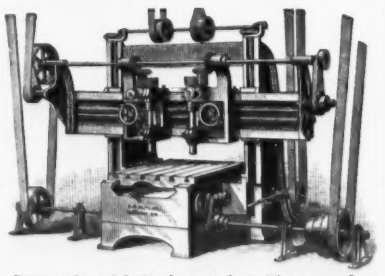

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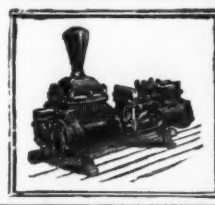

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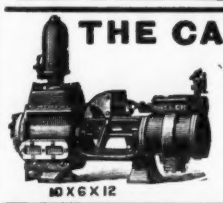

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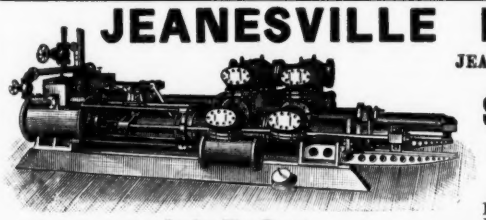

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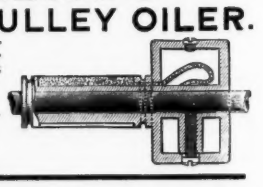

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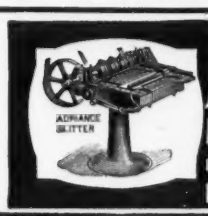

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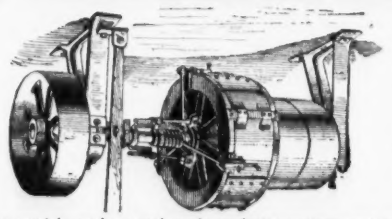

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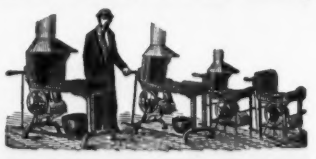

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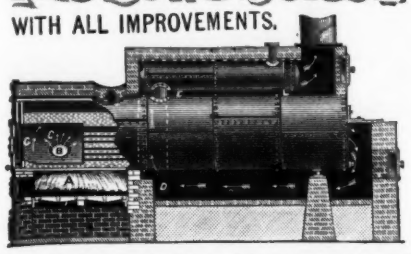

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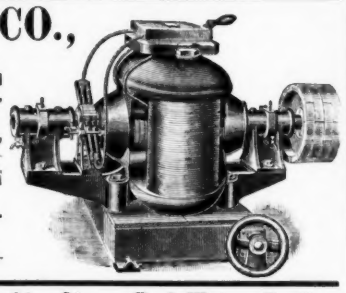

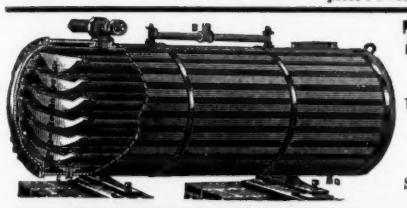

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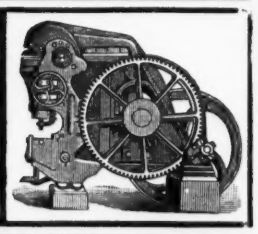

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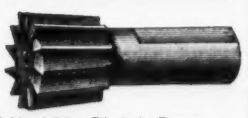

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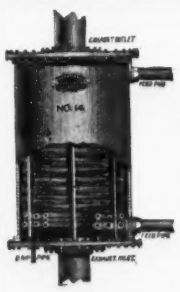

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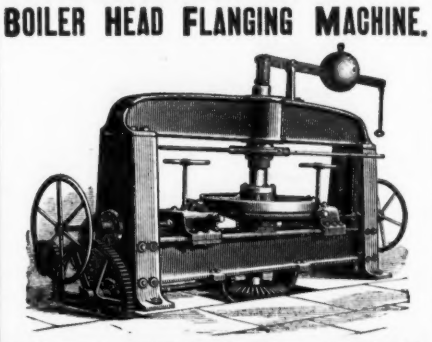

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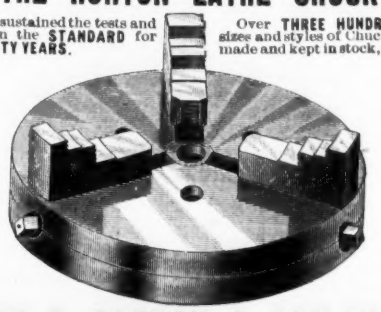

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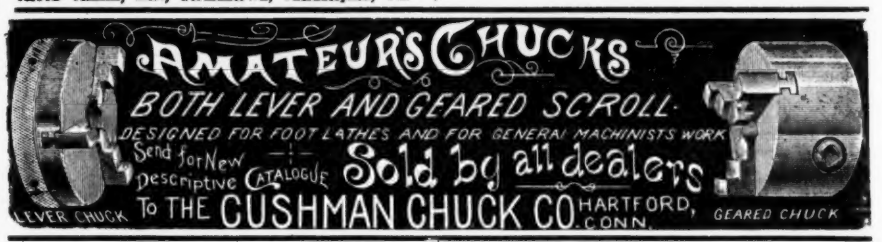
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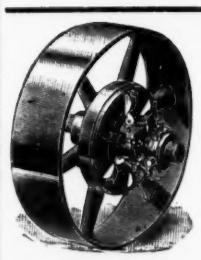

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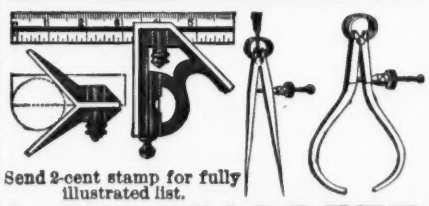

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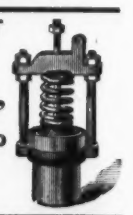

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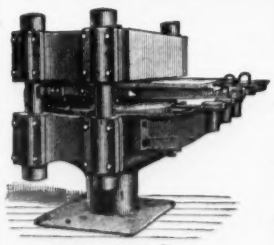

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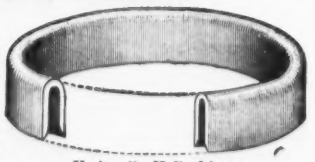

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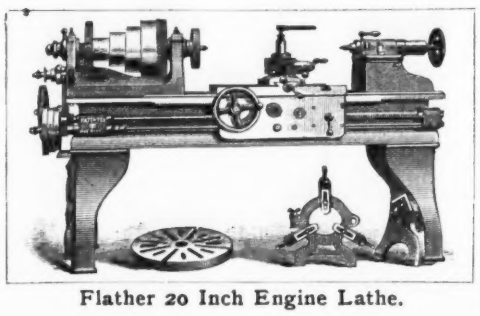

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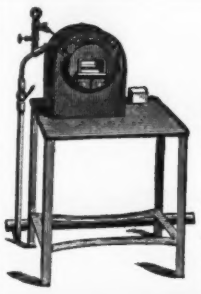

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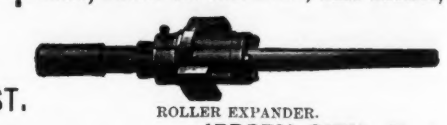

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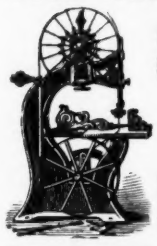

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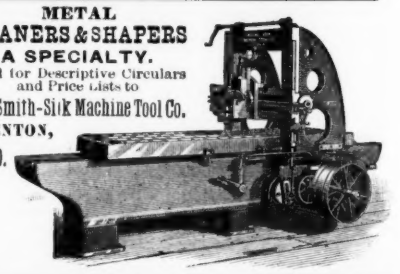

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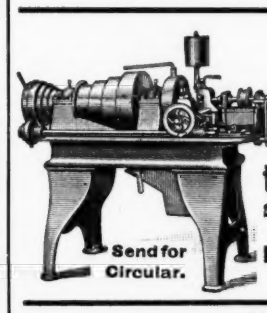

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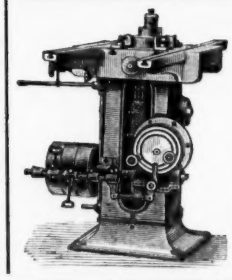

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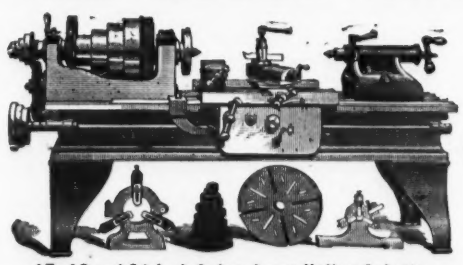

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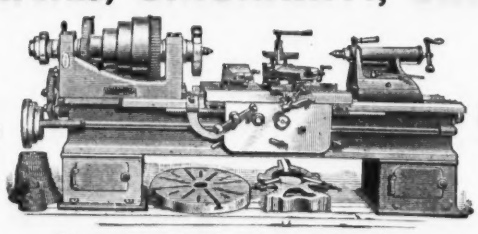

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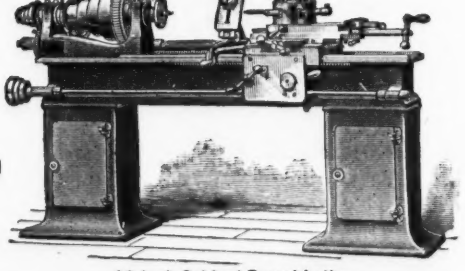

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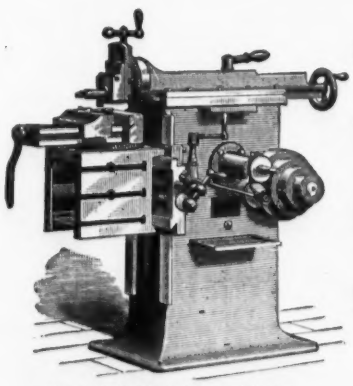

15 and 20-inch Crank Shaper.

Stroke changed and adjusted while running. Stroke at all times positive. Invariably plane to a line. Detachable Tables.

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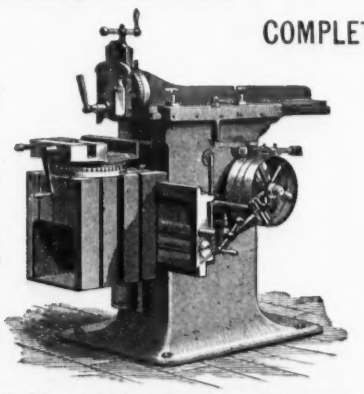
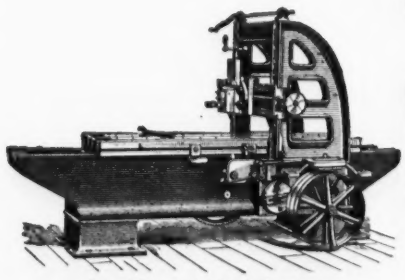


20, 26 and 32-inch Triple Geared Shapers.

Stroke changed while machine is running. Shaft can be passed through head of machine and key seat cut in same to any length. Extra heavy vises. Tables slotted on all sides.



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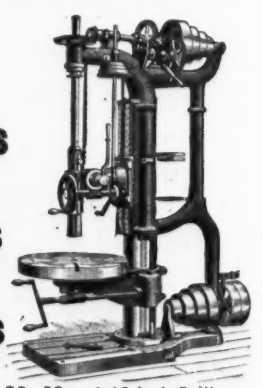

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Solid and Shell Reamers, Beach's Patent Self-Centering Chuck, Bit Stock Drills.
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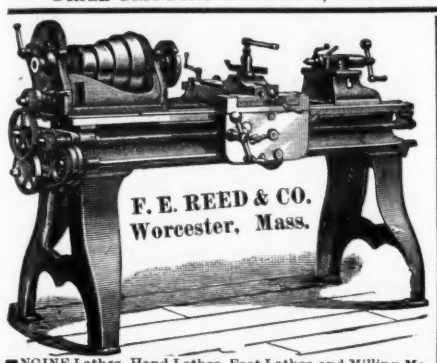

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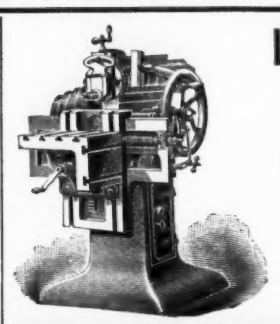

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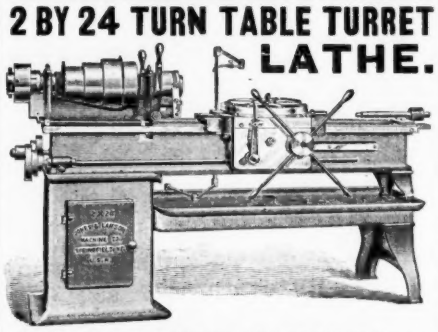

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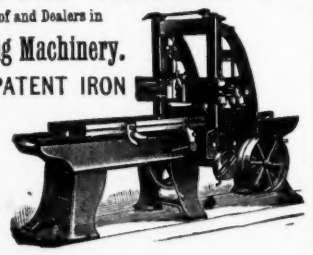

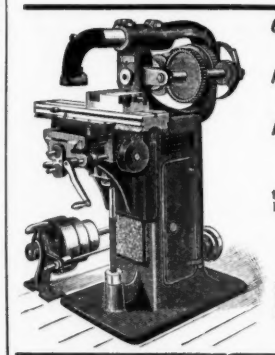

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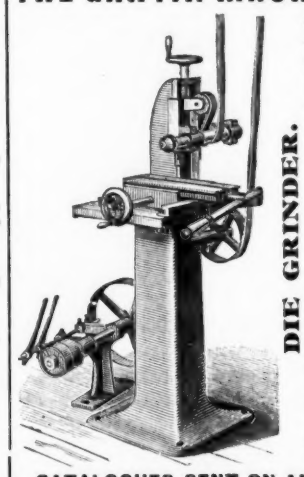

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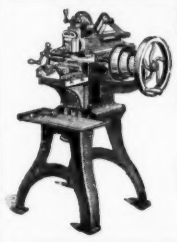

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It has no pumps. No valves. No piping to supply it with water. It has nothing to get out of order, is always ready for use. It is as easily managed as a grindstone and will give vastly better results.

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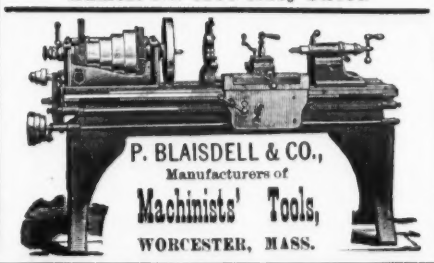

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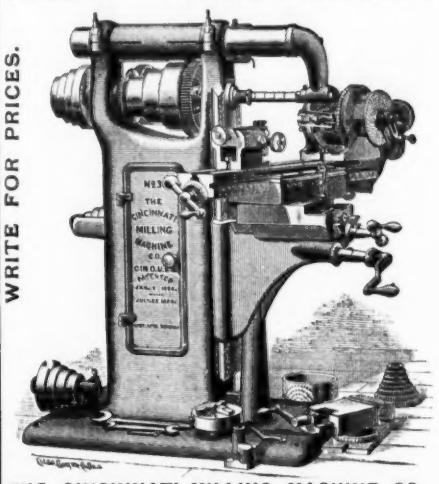

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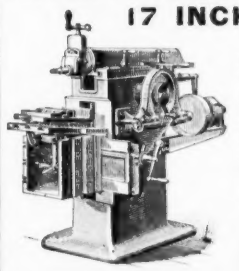

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Weight, 1300 lbs.
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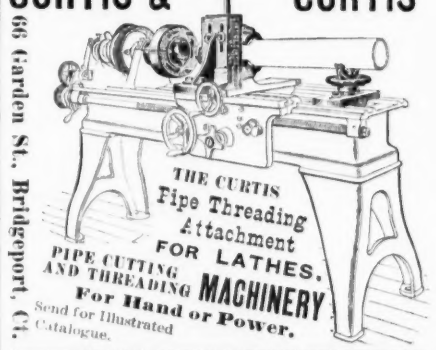

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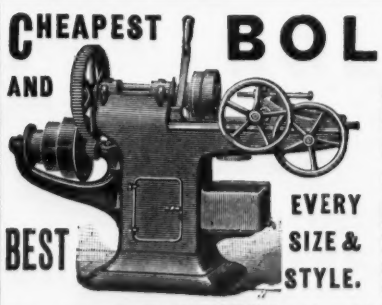

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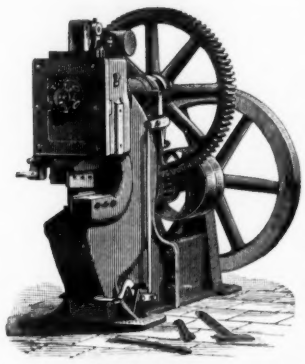

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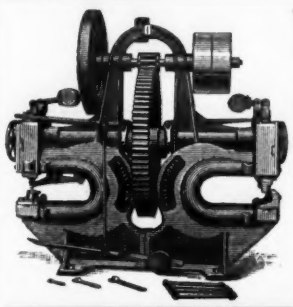

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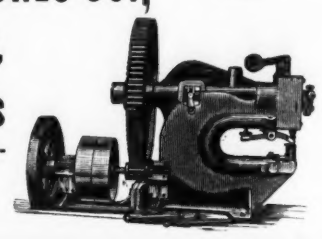

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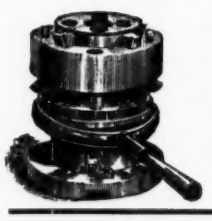

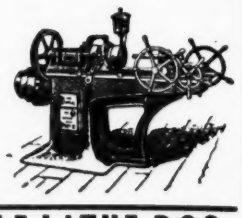

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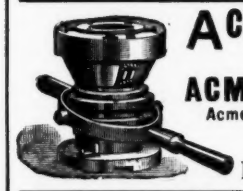

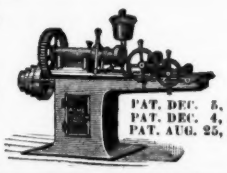

PAT. DEC. 5, 1882.
PAT. DEC. 4, 1883.
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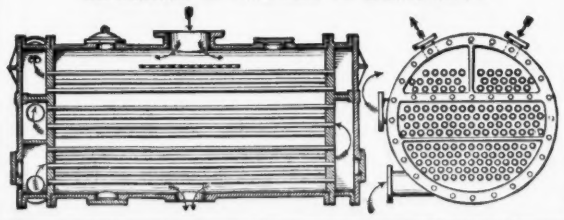

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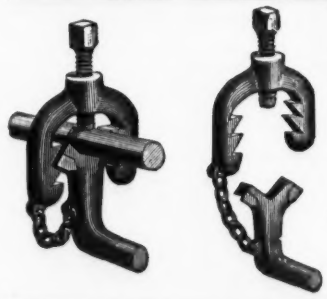

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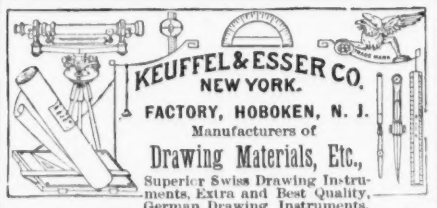

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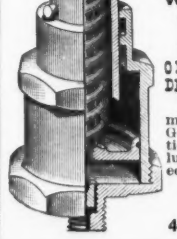

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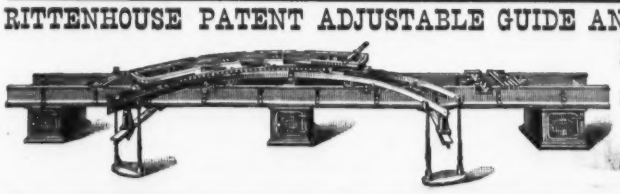

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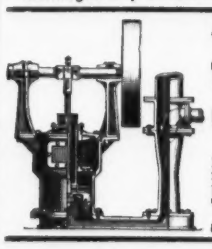

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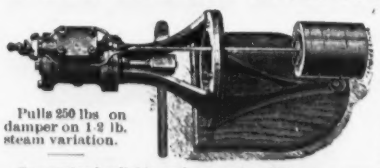

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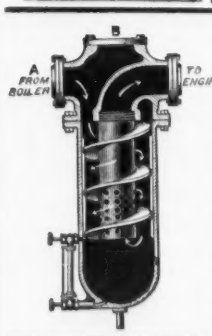

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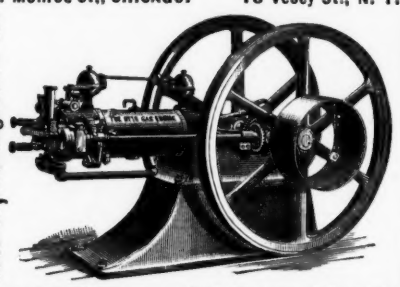

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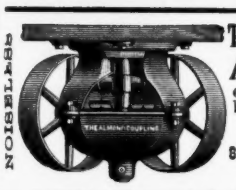

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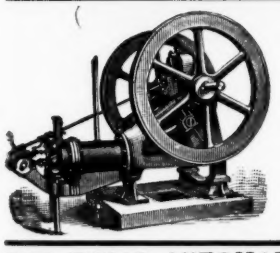

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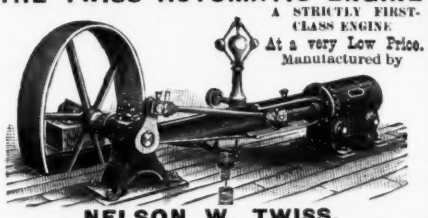

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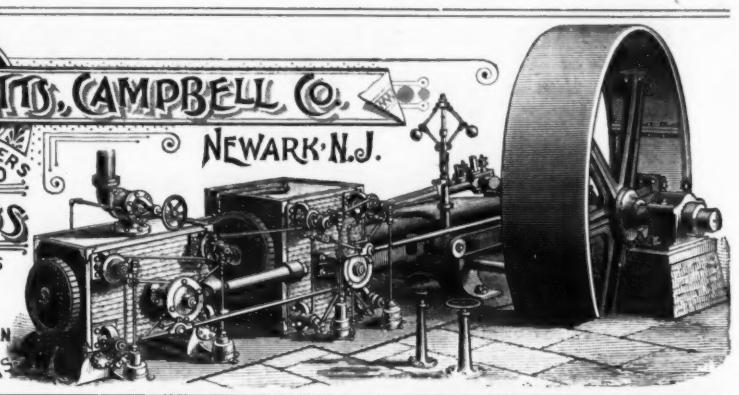

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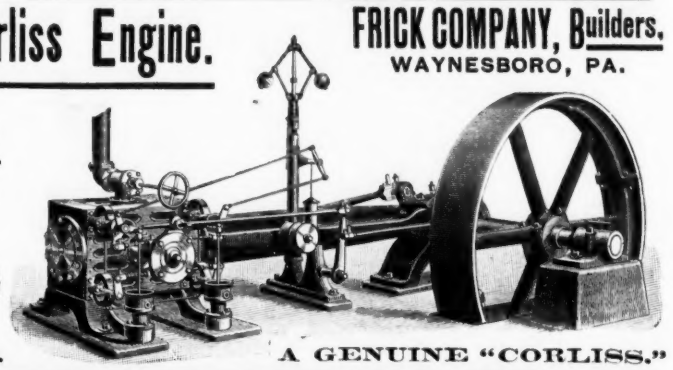

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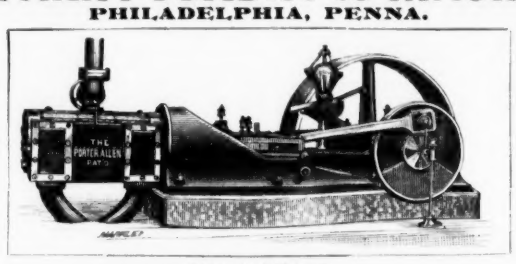

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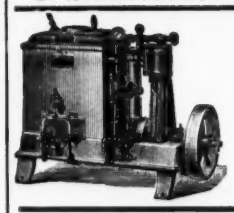

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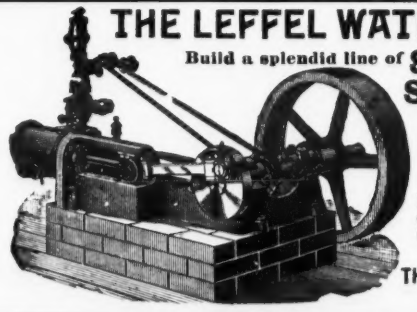

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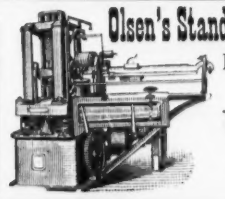

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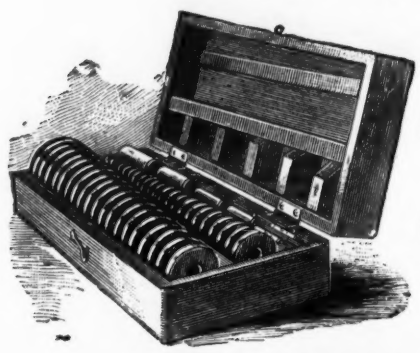

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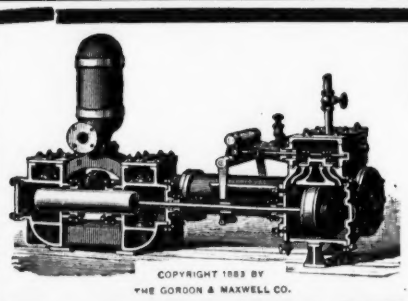

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Clayton Sewing Machine Motor Co.,
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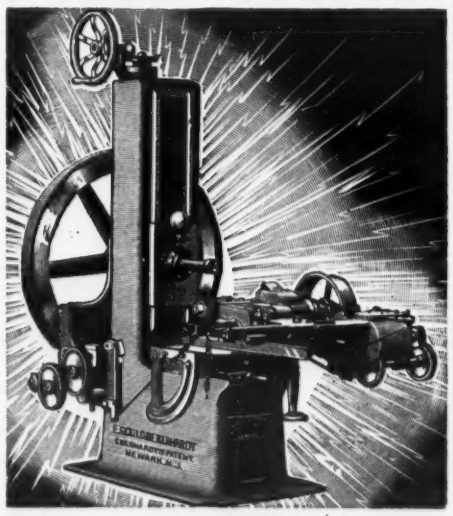
Beaman & Smith,
Geo. W. Fifield,
Garvin Machine Co.,
Simonds Rolling Mills,
New Haven Mfg. Co.,
Putnam Machine Co., and others.



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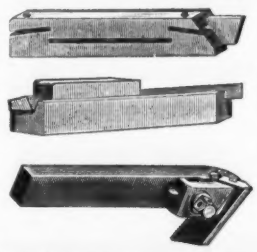

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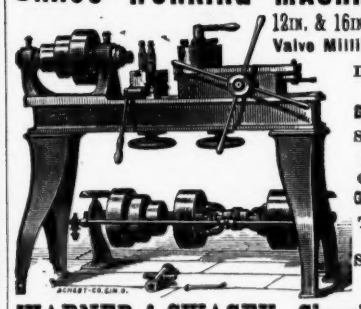

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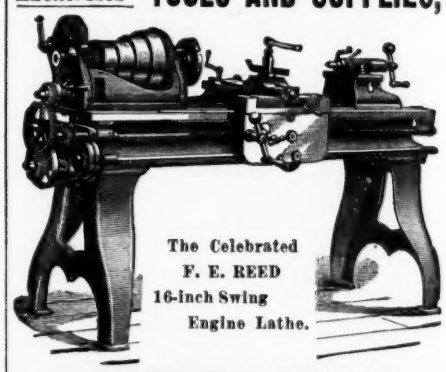

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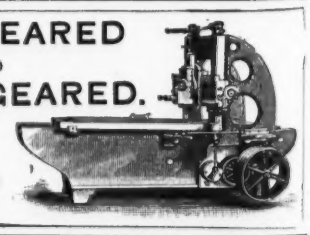

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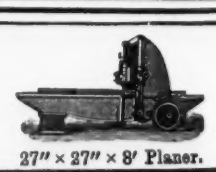

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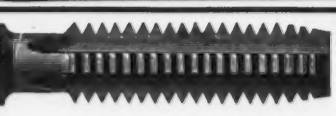

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